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WARNING

HIGH VOLTAGE

DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS UNIT UNLESS YOU ARE THOROUGHLY FAMILIAR WITH ITS OPERATION AND ARE EXPERIENCED IN SERVICING HIGH VOLTAGE EQUIPMENT. LETHAL VOLTAGES ARE PRESENT WHEN POWER IS APPLIED TO THE SYSTEM. BE EXTREMELY CAREFUL WHEN WORKING INSIDE THE UNIT. USE ONLY ONE HAND TO MAKE ANY MEASUREMENTS OR ADJUSTMENTS. IF POSSIBLE, TURN POWER OFF BEFORE MAKING ADJUSTMENTS.



WARNING



RADIO FREQUENCY RADIATION HAZARD

MICROWAVE AMPLIFIERS AND TUBES GENERATE HAZARDOUS RADIO FREQUENCY RADIATION WHICH CAN RESULT IN SEVERE BODILY INJURY INCLUDING CATARACTS, PRODUCING BLINDNESS. SOME CARDIAC PACEMAKERS MAY BE AFFECTED BY THE RF ENERGY EMITTED BY MICROWAVE AMPLIFIERS.

NEVER OPERATE A MICROWAVE TUBE WITHOUT A PROPERLY MATCHED RF ENERGY ABSORBING LOAD ATTACHED. ENSURE THAT PERSONNEL ARE NEVER PERMITTED NEAR ENERGIZED OPEN WAVEGUIDES OR ANTENNAS. IT IS PARTICULARLY IMPORTANT TO NEVER LOOK INTO AN OPEN WAVEGUIDE OR ENERGIZED ANTENNA. MONITOR ALL PARTS OF THE RF SYSTEM FOR RF RADIATION LEAKAGE BEFORE AND AFTER ALL SERVICE WORK AND AT REGULAR INTERVALS.

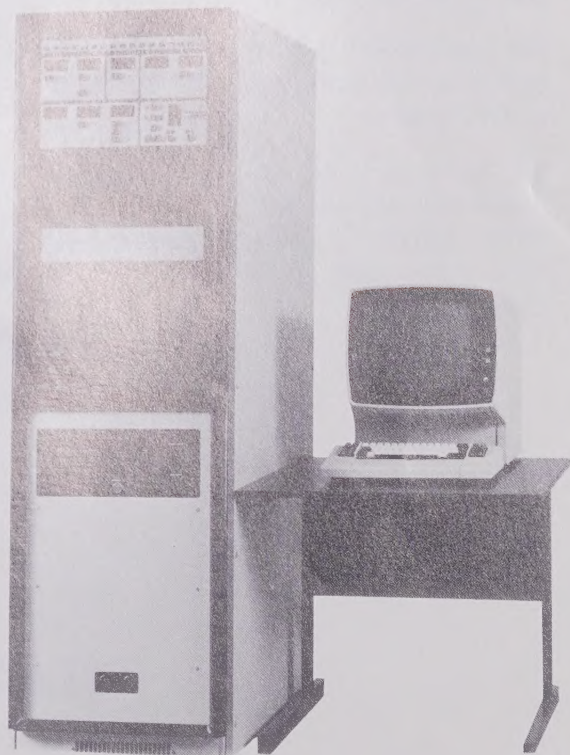
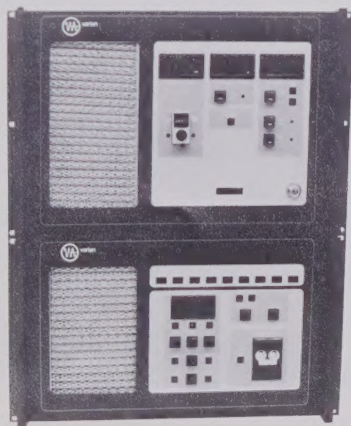
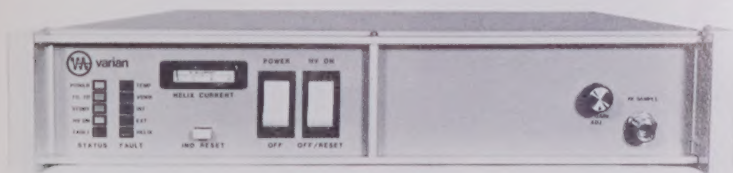
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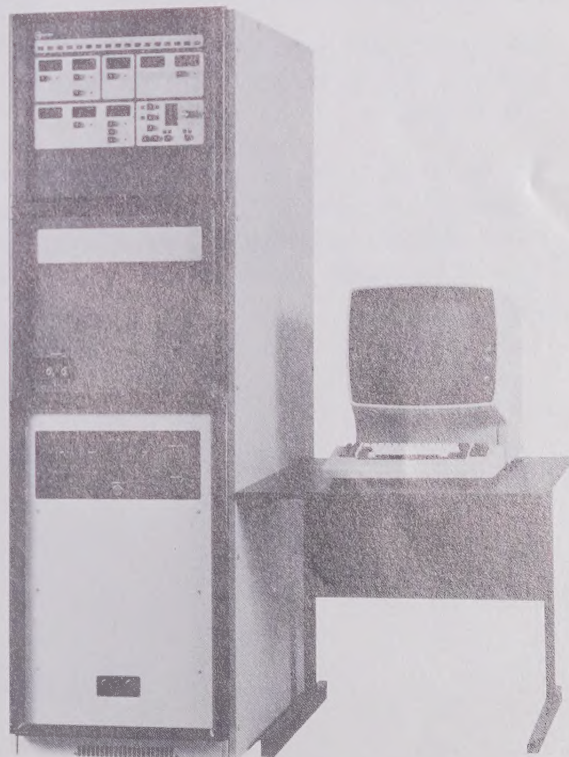
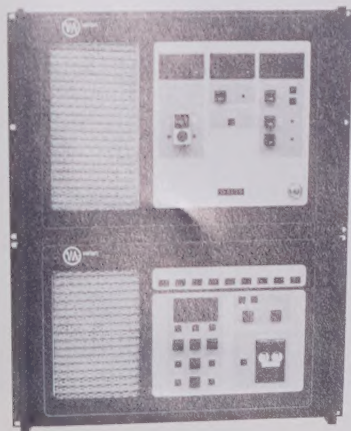
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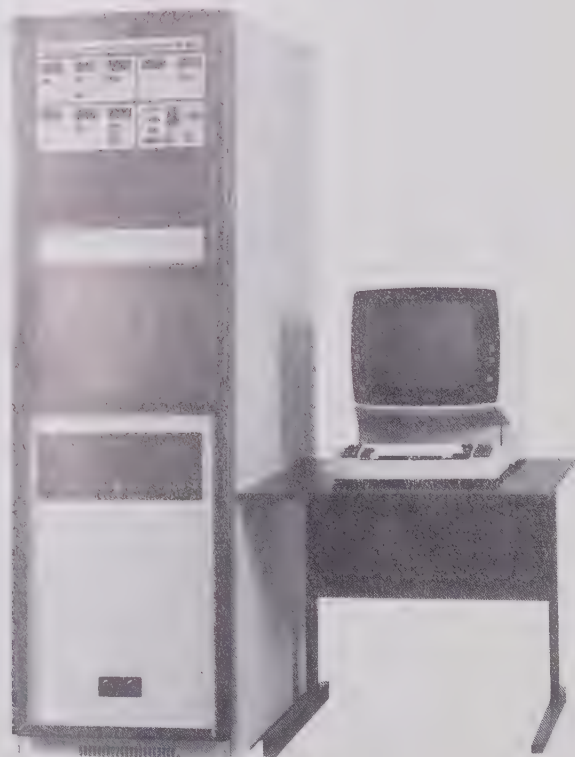
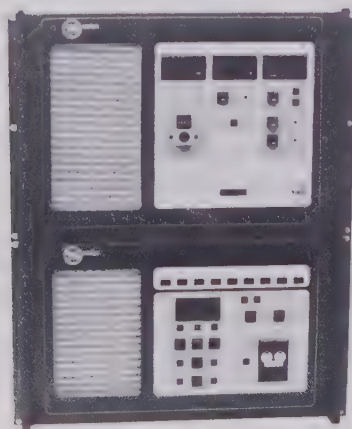
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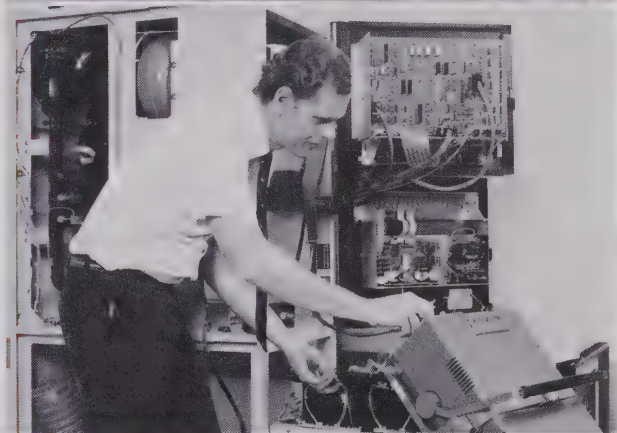
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OPERATION AND SERVICE MANUAL

FOR

100/200 WATT

GENERAL PURPOSE WIDE BAND TWTA

6900G SERIES

VARIAN ASSOCIATES

MICROWAVE EQUIPMENT DIVISION

**3200 PATRICK HENRY DRIVE
SANTA CLARA, CALIFORNIA 95054**

0892-2/87

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SAFETY SUMMARY

THIS EQUIPMENT HAS BEEN DESIGNED TO MINIMIZE EXPOSURE OF PERSONNEL TO SAFETY HAZARDS. THE NATURE OF THE EQUIPMENT IS SUCH THAT THERE ARE CERTAIN INHERENT HAZARDS THAT REQUIRE THAT THE OPERATOR OR TECHNICIAN WORKING WITH THIS EQUIPMENT HAVE CERTAIN SPECIFIC TRAINING AND KNOWLEDGE. THE RF AMPLIFIER TUBES USED IN THE EQUIPMENT OPERATE WITH HIGH VOLTAGE POWER SUPPLIES AND DELIVER HIGH LEVELS OF MICROWAVE ENERGY. OPERATORS OR TECHNICIANS THAT WORK WITH THIS EQUIPMENT MUST BE TRAINED IN THE USE OF SUCH EQUIPMENT AND FAMILIAR WITH THIS PARTICULAR UNIT. GUIDELINES FOR DEALING WITH SAFETY HAZARDS ARE INCLUDED IN THE SUPPLEMENTARY DATA SECTION OF THIS MANUAL YOU SHOULD BECOME FAMILIAR WITH THESE GUIDELINES PRIOR TO OPERATING OR SERVICING THE EQUIPMENT.

PLEASE READ AND OBSERVE THE FOLLOWING CAUTIONS AND WARNINGS THAT ARE CONTAINED IN THE BODY OF THIS MANUAL.

CAUTION/WARNING

TEXT PAGE

WARNING

LETHAL VOLTAGES UP TO 15 KV ARE PRESENT WHEN POWER IS APPLIED TO THE SYSTEM. BE EXTREMELY CAREFUL WHEN WORKING INSIDE THE UNIT. USE ONLY ONE HAND TO MAKE MEASUREMENTS OR ADJUSTMENTS. IF POSSIBLE, TURN POWER OFF BEFORE MAKING ADJUSTMENTS. DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS UNIT UNLESS YOU HAVE HAD EXPERIENCE IN SERVICING BOTH MICROWAVE AND HIGH VOLTAGE SYSTEMS.

2-11
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CAUTION

DO NOT OVERTIGHTEN, AS THIS COULD STRIP THE THREADS OF THE MATING FLANGE.

3-4

CAUTION

OPERATING THE PA WITH UNTERMINATED OR EXCESSIVE LOAD VSWR COULD CAUSE DESTRUCTION OF THE TWT AND WILL VOID THE WARRANTY. THE MAXIMUM LOAD VSWR SHOULD NOT EXCEED 1.5:1.

3-5

SAFETY SUMMARY (Continuation)

CAUTION/WARNING

TEXT PAGE

WARNING

LETHAL VOLTAGES UP TO 15KV ARE PRESENT IN THE POWER AMPLIFIER WHEN IT IS OPERATING. USE EXTREME CAUTION WHEN WORKING INSIDE THE UNIT. AS AN ADDED PRECAUTION IT IS RECOMMENDED THAT ANOTHER PERSON BE PRESENT TO GIVE AID IN CASE OF ACCIDENT.

4-3

CAUTION

FAILURE TO OBSERVE ANY OF THE ABOVE CONDITIONS CAN CAUSE CATASTROPHIC DAMAGE TO THE UNIT AND WILL VOID THE WARRANTY.

4-5

CAUTION

PRIOR TO PERFORMING STEP E. CHECK THE PA DATA SHEET TO DETERMINE THE PROPER RF DRIVE LEVEL. DO NOT EXCEED THIS LEVEL BY MORE THAN 6 dB. OVERDRIVE OF THE PA COULD CAUSE DAMAGE TO THE EQUIPMENT.

4-6

WARNING

TREAT THE OPEN UNIT AS THOUGH HIGH VOLTAGE WAS ON WHENEVER THE COVERS ARE OFF THE UNIT.

6-2

WARNING

ANY TIME THE TOP COVER IS OFF, YOU ARE EXPOSED TO 120/230 VAC FROM THE PRIME POWER SOURCE IF THE PA IS CONNECTED TO THE PRIME POWER DISTRIBUTION SYSTEM.

6-3

CAUTION

PRIOR TO APPLYING POWER TO THE UNIT, VERIFY THAT A SUITABLE RF LOAD, ADEQUATE TO HANDLE UP TO 400W CW WITHOUT DAMAGE, AND WITH A MAXIMUM VSWR OF 1.5:1 ACROSS THE POWER AMPLIFIER OPERATING RANGE, IS PROVIDED AT ALL TIMES. OPERATION OF THE SYSTEM WITHOUT A SUITABLE LOAD CAN DAMAGE OR DESTROY THE TWT.

6-3

WARNING

TURN ALL POWER OFF BEFORE ATTEMPTING ANY CLEANING OPERATION. WHEN USING SOLVENTS, BE SURE TO PROVIDE ADEQUATE VENTILATION AND AVOID BREATHING THE FUMES. WHEN CLEANING WITH AIR, WEAR SAFETY GOGGLES AND USE CLEAN, DRY, COMPRESSED AIR NOT EXCEEDING 25 PSI.

6-6

SAFETY SUMMARY (Continuation)

CAUTION/WARNING

TEXT PAGE

WARNING

LETHAL VOLTAGES UP TO 15 KV ARE PRESENT IN THE POWER AMPLIFIER WHEN IT IS OPERATING. USE EXTREME CAUTION WHEN WORKING INSIDE THE UNIT. AS AN ADDED PRECAUTION, IT IS RECOMMENDED THAT ANOTHER PERSON BE PRESENT TO GIVE AID IN CASE OF ACCIDENT. DO NOT ATTEMPT TO SERVICE THE PA UNLESS YOU ARE FAMILIAR WITH SAFETY PROCEDURES FOR RF AND HIGH VOLTAGE SERVICING OPERATIONS.

6-10

WARNING

THE BODY OF THE HIGH VOLTAGE MONITOR WILL BE FLOATING UNLESS THE GROUND LEAD IS PROPERLY ATTACHED. IN ADDITION, ANY VOLTAGE READING MADE WITHOUT USE OF THE GROUND WILL BE SUSPECT.

6-29
6-31

WARNING

THE MEASUREMENT OF THE CATHODE TO HELIX VOLTAGE EXPOSES THE OPERATOR TO POTENTIAL VOLTAGES AS HIGH AS 15 KV. EXTREME CAUTION MUST BE EXERCISED IN MEASURING THE HIGH VOLTAGE SECTIONS OF THIS POWER SUPPLY.

6-31

CAUTION

DO NOT DISTURB THE LOWER MOUNTING BOLTS OF THE A1 BOARD. THEY DO NOT HAVE TO BE CHANGED OR LOOSENED TO REMOVE THE LOGIC BOARD.

6-43

WARNING

APPLICATION OF 200 VDC TO THE HIGH VOLTAGE MODULE IN A NO-LOAD CONDITION WILL GENERATE A 15 KV OUTPUT. EXTREME CAUTION IS REQUIRED TO AVOID PERSONNEL INJURY.

6-46

WARNING

THE FOLLOWING PROCEDURES INVOLVE A HIGHER POTENTIAL HAZARD TO PERSONNEL THAN THOSE IN SECTION 6.3.4. VARIAN STRONGLY RECOMMENDS THE USE OF THE VARIAN H.V. MONITOR IF AT ALL POSSIBLE.

6-51

SAFETY SUMMARY (Continuation)

CAUTION/WARNING

TEXT PAGE

WARNING

THIS IS A POTENTIALLY RISKY PROCEDURE IF THE H.V. IS
TURNED ON FOR ANY REASON. DO NOT TURN ON THE H.V.
TAPE THE H.V. CONTROL IN THE OFF/RESET POSITION.

6-53

BE CAREFUL TO AVOID CONTACT WITH THE RFI FILTER ADJACENT
TO THE H.V. MODULE BECAUSE IT IS LIVE WITH LINE VOLTAGE
POTENTIAL OF 120 OR 230 VAC WHENEVER THE TWT IS CON-
NECTED TO THE PRIME POWER DISTRIBUTION SYSTEM.

WARNING

THIS PROCEDURE CAN BE RISKY BECAUSE IT INVOLVES OPENING
THE H.V. MODULE WHICH GENERATES VOLTAGES TO 15 KV. STAY
PHYSICALLY CLEAR OF THE H.V. MODULE AND MAKE SURE EVERY-
ONE ELSE IS CLEAR BEFORE TURNING THE H.V. ON.

6-54

WARNING

DO NOT CHANGE TAPS AT THIS POINT.

6-56



WARNING

HIGH VOLTAGE

DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS UNIT UNLESS YOU ARE THOROUGHLY FAMILIAR WITH ITS OPERATION AND ARE EXPERIENCED IN SERVICING HIGH VOLTAGE EQUIPMENT. LETHAL VOLTAGES ARE PRESENT WHEN POWER IS APPLIED TO THE SYSTEM. BE EXTREMELY CAREFUL WHEN WORKING INSIDE THE UNIT. USE ONLY ONE HAND TO MAKE ANY MEASUREMENTS OR ADJUSTMENTS. IF POSSIBLE, TURN POWER OFF BEFORE MAKING ADJUSTMENTS.



WARNING



RADIO FREQUENCY RADIATION HAZARD

MICROWAVE AMPLIFIERS AND TUBES GENERATE HAZARDOUS RADIO FREQUENCY RADIATION WHICH CAN RESULT IN SEVERE BODILY INJURY INCLUDING CATARACTS, PRODUCING BLINDNESS. SOME CARDIAC PACEMAKERS MAY BE AFFECTED BY THE RF ENERGY EMITTED BY MICROWAVE AMPLIFIERS.

NEVER OPERATE A MICROWAVE TUBE WITHOUT A PROPERLY MATCHED RF ENERGY ABSORBING LOAD ATTACHED. ENSURE THAT PERSONNEL ARE NEVER PERMITTED NEAR ENERGIZED OPEN WAVEGUIDES OR ANTENNAS. IT IS PARTICULARLY IMPORTANT TO NEVER LOOK INTO AN OPEN WAVEGUIDE OR ENERGIZED ANTENNA. MONITOR ALL PARTS OF THE RF SYSTEM FOR RF RADIATION LEAKAGE BEFORE AND AFTER ALL SERVICE WORK AND AT REGULAR INTERVALS.

SECTION 1

INTRODUCTION

1.1 GENERAL

The Varian (6900G Series) General Purpose, Power Amplifiers (PAs) are self-contained, broad band, general purpose CW amplifiers that may be used with a variety of Traveling Wave Tubes (TWTs) in a variety of applications. This series is based on a several standard designs that may be configured for operation in the 1 to 18 GHz range with RF output power levels of 100 to 200 Watts.*

1.2 TWTs AVAILABLE

The basic model number of an individual amplifier is directly related to the TWT selected for a particular application. Table 1-1 shows the standard models, the specific TWT for that model number, the gain, the frequency band, and the output power level of that TWT.

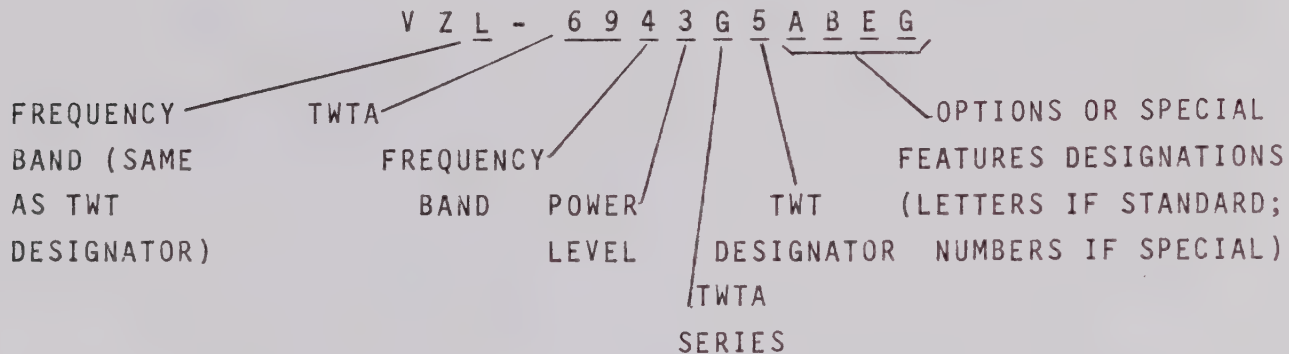
1.3 MODEL NUMBER INTERPRETATION

Each 6900G Series PA configuration is designated by a specific model number. When the configuration is a basic unit plus up to four standard options, the model number completely describes the unit. Units having more than four standard options or those with non-standard options (special features) are referred through the model number to a special drawing. When Special Features are included, they are described in detail in the Special Features Section of this manual.

TABLE 1-1

6900G SERIES PA MODEL AND OPTION DESIGNATIONS

Standard form of 6900G Series PA Model Numbers. Example:



Basic unit without options would be: Example: VZL-6953

Standard Options Available:

- | | |
|-----------------------|---------------------------|
| A. Input Isolator | J. Front Panel Connectors |
| B. Input Attenuator | K. 230 VAC Prime Power |
| E. Output Sample Port | L. Solid State Amplifier |
| G. Remote Interface | M. VSWR Protection |
| H. Elapsed Time Meter | N. PIN Diode Switch |

Model Number with up to four standard options. Example:

VZL-6943G5-ABEG

(Includes Input Isolator, Input Attenuator, Output Sample Port, and Remote Interface.

Model number for special features and/or more than four options.

Example: VZL-6943G51532

Configuration is defined on Drawing No. 01001532.

1.3.1 Standard Options Available

Standard options available are listed in Table 1-1.

1.4 PACKAGING

The TWTA is contained in a slide-mounted, 12.25 inch high, standard rack-mounted drawer which includes integral forced air cooling, power supplies, RF components, and control circuitry. The standard configuration provides RF input/output and prime power connections on the Rear Panel.

1.5 Specifications

Table 1-3 specifies the general electrical performance for the PAs. Table 1-5 lists the mechanical and environmental specifications.

TABLE 1-2

ELECTRICAL SPECIFICATIONS FOR VARIAN
6900G SERIES 100 to 200 WATT, GENERAL PURPOSE PAs

<u>PARAMETER</u>	<u>VALUE</u>
Power Levels	100 to 200 Watts CW standard (see Table 1-4) and the applicable Test Specification in Section 7.
Frequencies	1 to 18 GHz (see Table 1-4 and the applicable Test Specification in Section 7).
Gain	30-45 dB (see Table 1-4).
Input/Output Impedance	50 ohms nominal TWT impedance or waveguide
Noise Figure	30 dB, maximum of all 100 Watt and most 200 Watt CW PAs; 40 dB, maximum for 200 Watt CW and above PAs.
Power Output Stability	Typical long term 0.25 dB/24 hours at constant drive and constant temperature.
Spurious Noise Levels	At least -45 dBc (typically -50 dBc) excluding harmonics and residual modulation.
Prime Power	115 VAC + 10%, 50 to 60 Hz, single-phase. 1900 Watts for the 100 Watt units and 2400 Watts for the 200 Watt units.
Residual AM & PM Noise	At least -45 dBc. Typically better than -55 dBc.

TABLE 1-3

MECHANICAL/ENVIRONMENTAL SPECIFICATIONS FOR
VARIAN 6900G SERIES GENERAL PURPOSE PAs

<u>PARAMETER</u>	<u>VALUE</u>
Size	
Height	12.25 inches (31 cm)
Depth	24.00 inches (61 cm)
Width	19.00 inches (48 cm)
Weight (Range)	240 to 275 pounds (109 to 125 kg)
Temperature Range	+32 to +122 ⁰ F (0 to +50 ⁰ C) standard operation. All metal ceramic tubes rated for high reliability in military environments typically -54 ⁰ C to +110 ⁰ C.

TABLE 1-4
STANDARD MODELS
6900G SERIES GENERAL PURPOSE PAs

PA MODEL NUMBER	FREQUENCY (GHz)	POWER WATTS	GAIN	OUTPUT	TUBE TYPE
			AT RATED		
			POWER (dB)	RF CONN	
VZL-6943G5	1 - 2	200	30	TYPE N	VTL-6242F1
VZS-6953G5	2.0-4.0	200	37	TYPE N	VTS-6252F1
VZC-6962G5	4.0-8.0	100	35	TYPE N	VTC-6260F1
VZC-6963G5	4.0-8.0	200	37	TYPE N	VTC-6262F1
VZX-6983G5	8.0-12.4	200	35	UG-39/U	VTX-6282F1
VZU-6992G5	12.4-18.0	100	37	UG-419/U	VTU-6290F1
VZM-6992G6	9.0-17.0	100	37	WRD750D24	VTU-6295F1
VZM-6993G5	8.0-17.0	200	35	WRD750D24	VTM-6294M2

NOTE: UNLESS OTHERWISE SPECIFIED, INPUT RF CONNECTOR IS TYPE SMA.

SECTION 2

FUNCTIONAL DESCRIPTION

2.1 GENERAL

The 6900G Series PAs are designed for simple and reliable operation. They are self-protected against damage from most internal fault conditions. Typically, octave frequency bands are covered without need for tuning or other operator adjustment. The units include proportional heater time delay as a standard feature. Once placed into operation, the PA will recycle back into operation automatically after prime power interruptions. The PAs are functionally divided into the following four sections: Front Panel, Rear Panel, Power Supply, and RF Sections.

2.2 FRONT PANEL

The Front Panel of the Power Amplifier is the primary operator interface with the PS and provides the necessary controls and indicators to permit control and monitoring of the PS (See Figure 2-1).

2.2.1 Status Indicator

The multi-function Status Indicator display (annunciator) is located in the top center of the PA Front Panel. Standard indicators provided are: power on, filament time delay, standby, high voltage on, summary fault, cover interlock fault, helix current fault, TWT overtemperature fault, external interlock fault, remote control fault, reflected power fault, and power supply fault.

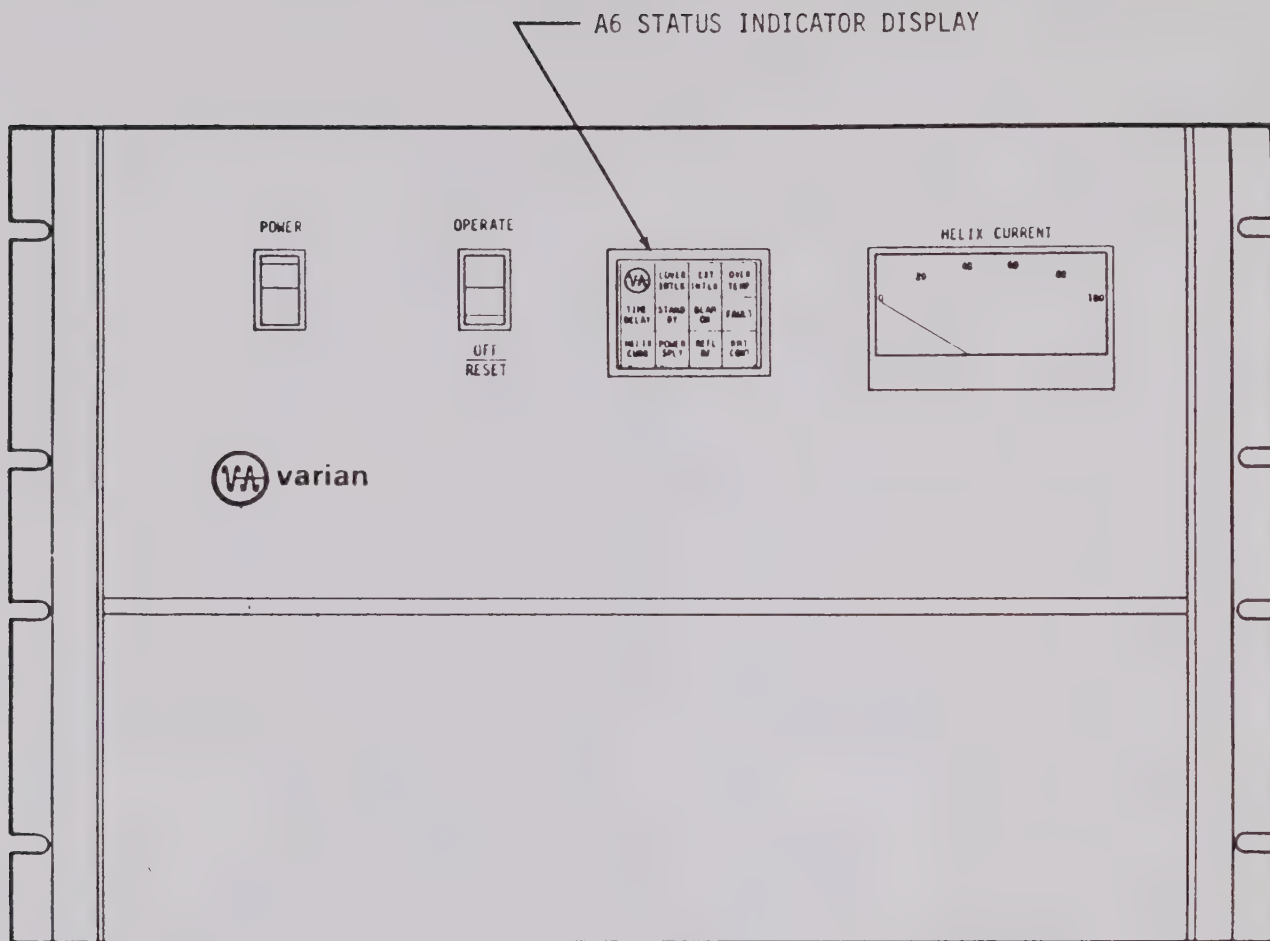


FIGURE 2-1

6900G SERIES PA
STANDARD FRONT PANEL A5

a. POWER ON

When the power on/off control of the PA is turned to the "ON" position, the Varian logo on the Status Indicator will light red.

b. TIME DELAY

The Time Delay indicator lights when the PA is initially turned on or following a brief prime power interruption. The indicator shows that the TWT filaments are in the process of heating. The filament heating time is approximately three minutes (depending on tube requirements and the duration of the power outage). Thus, in the event of a power failure, the length of time delay (up to three minutes) will be proportional to the length of the power failure.

c. STANDBY

The Standby indicator lights to show that the filament time delay is complete, no PA faults are registered, and that the high voltage (H.V.) can be turned on. It is also an indication that the delay is over, no faults exist, and the H.V. is off.

d. BEAM ON

The Beam On indicator lights when the OPERATE switch is set to ON and shows that helix and collector voltages are applied to the TWT and that no fault condition exists.

e. FAULT

The Fault indicator lights when a major fault occurs. The faults monitored in the PA are: helix overcurrent, TWT overtemperature, cover interlock, and various power supply faults. Any one of the above faults will cause the high voltage to turn-off and light the fault indicator which will stay latched until reset.

2.2.2 Control Switches

Two controls are provided on the PA: The POWER On/Off Circuit Breaker and the OPERATE/OFF/RESET switch.

The Power ON/OFF Circuit Breaker controls prime power application to the internal circuitry and provides prime power overcurrent protection for the amplifier. The OPERATE/OFF/RESET switch controls the high voltage and resets some common faults and fault indicators. Some faults can only be reset when the POWER Circuit Breaker is set to OFF.

2.2.3 Helix Current Meter

The HELIX CURRENT Meter provides an analog indication of the TWT helix current. The meter is calibrated in milliamperes.

2.3 REAR PANEL

The Rear Panel of the PA contains various interface points that are required during initial installation or service (See Figure 2-2).

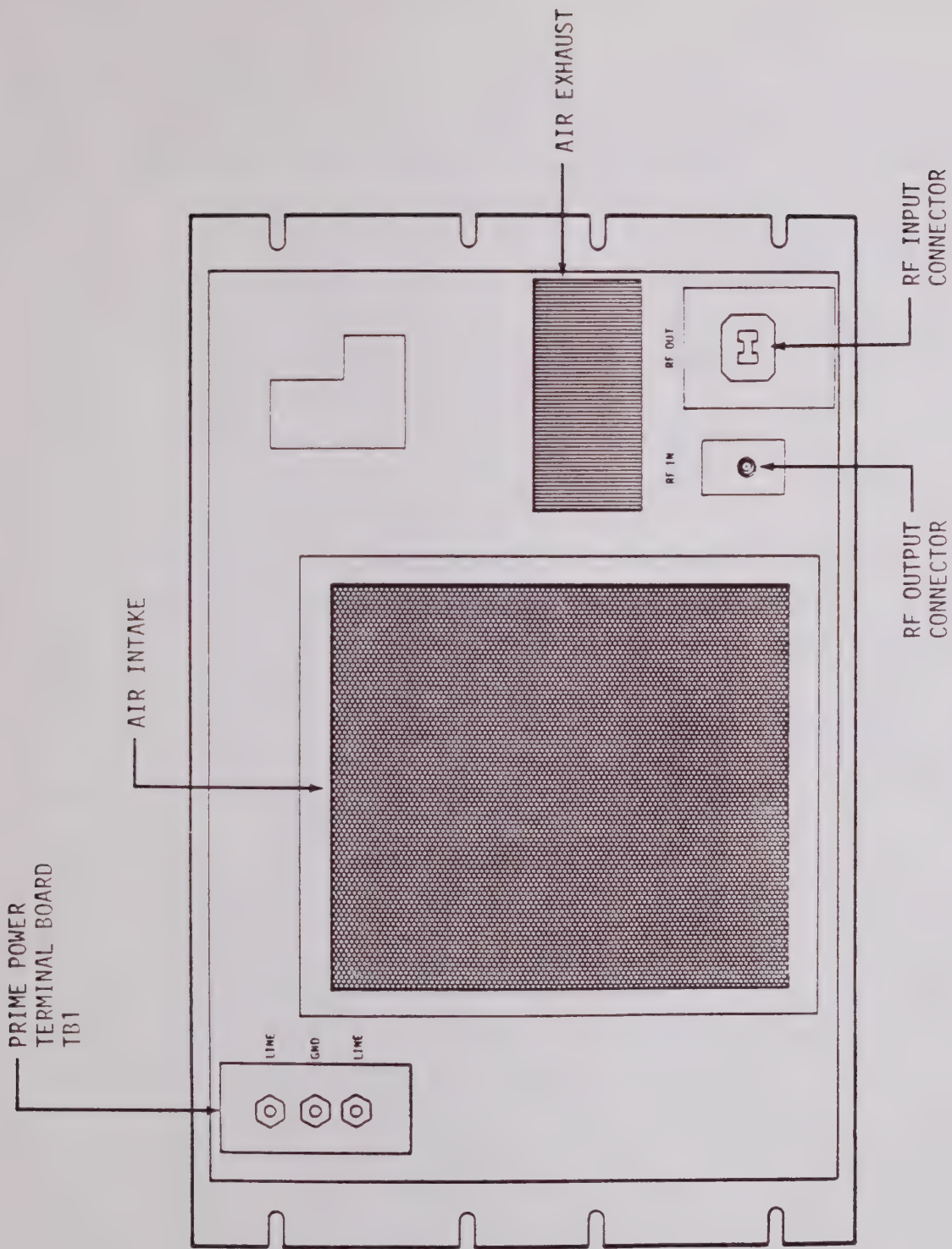


FIGURE 2-2

6900G SERIES 100/200 WATT GENERAL PURPOSE WIDE BAND TWT - STANDARD REAR PANEL

OR 94-8/R4

2.3.1 RF Input

On the standard amplifier, the RF INPUT signal is applied through an SMA female connector located on the rear panel. As an option, the RF Input may be located on the Front Panel

2.3.2 RF Output

The PA output is waveguide or a type N female connector depending on amplifier model (See Table 1-4).

2.3.3 Air Intake Exhaust

Forced air for cooling is provided by an internal blower. The air intake exhaust ports are located on the Rear Panel. The cooler air enters on the left side and exhausts as hotter air on the right side (See Figure 2-2).

2.3.4 Prime Power Connections

The prime power input is applied to the PA at TB1 on the Rear Panel.

2.3.5 Remote Interface (Option G)

A Remote Interface Connector (J2) and Switch can be provided. This permits remote control and status monitoring of the PA.

2.4 POWER SUPPLY SECTION

2.4.1 General

The Power Supply is based on a modular design derived from Varian experience with ground station communication systems PAs. A block diagram of the Power Supply is shown in Figure 2-3. This unit provides the sequential commands, interfaces, protection circuits, and voltages required for operation. The standard power supply is located in the upper portion of the PA Assembly (see Figure 2-4) and consists of six printed circuit cards, a High Voltage Module, and chassis mounted components. Functionally it can be divided into six parts.

2.4.2 Logic PWB Assembly A1

The Logic Board provides the logic functions necessary to control and sense amplifier conditions and to drive the Status Indicator Displays on the Front Panel. This board also monitors fault status, provides proportional time delay, and controls the application of collector and helix voltage.

2.4.3 Oscillator Bias PWB Assembly A2

The Oscillator Bias board contains a number of circuits. The first of these is a 10 KHz oscillator. This supplies base drive current to the high voltage converter and also synchronizes the switch regulator. Voltages of +12, +5, -5, -15 and -30 VDC are generated on this board. It also contains sense circuitry and latches for a number of protection functions such as 250V over/under voltage, 200V over/under voltage, 38V over/under voltage. The outputs of the protective circuits are summed in a common summary fault line which goes to the logic control board.

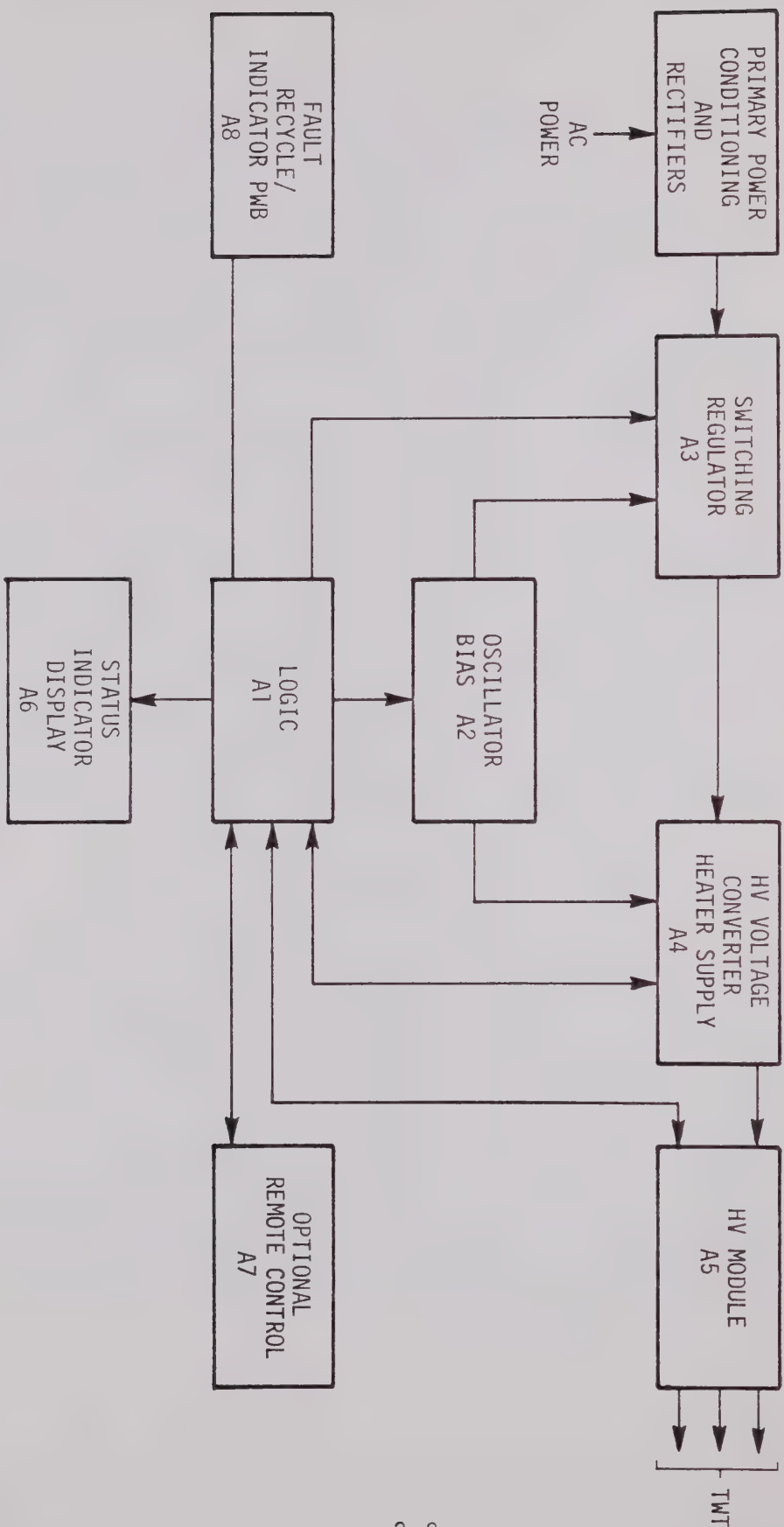


FIGURE 2-3 POWER SUPPLY BLOCK DIAGRAM

0895-8/84

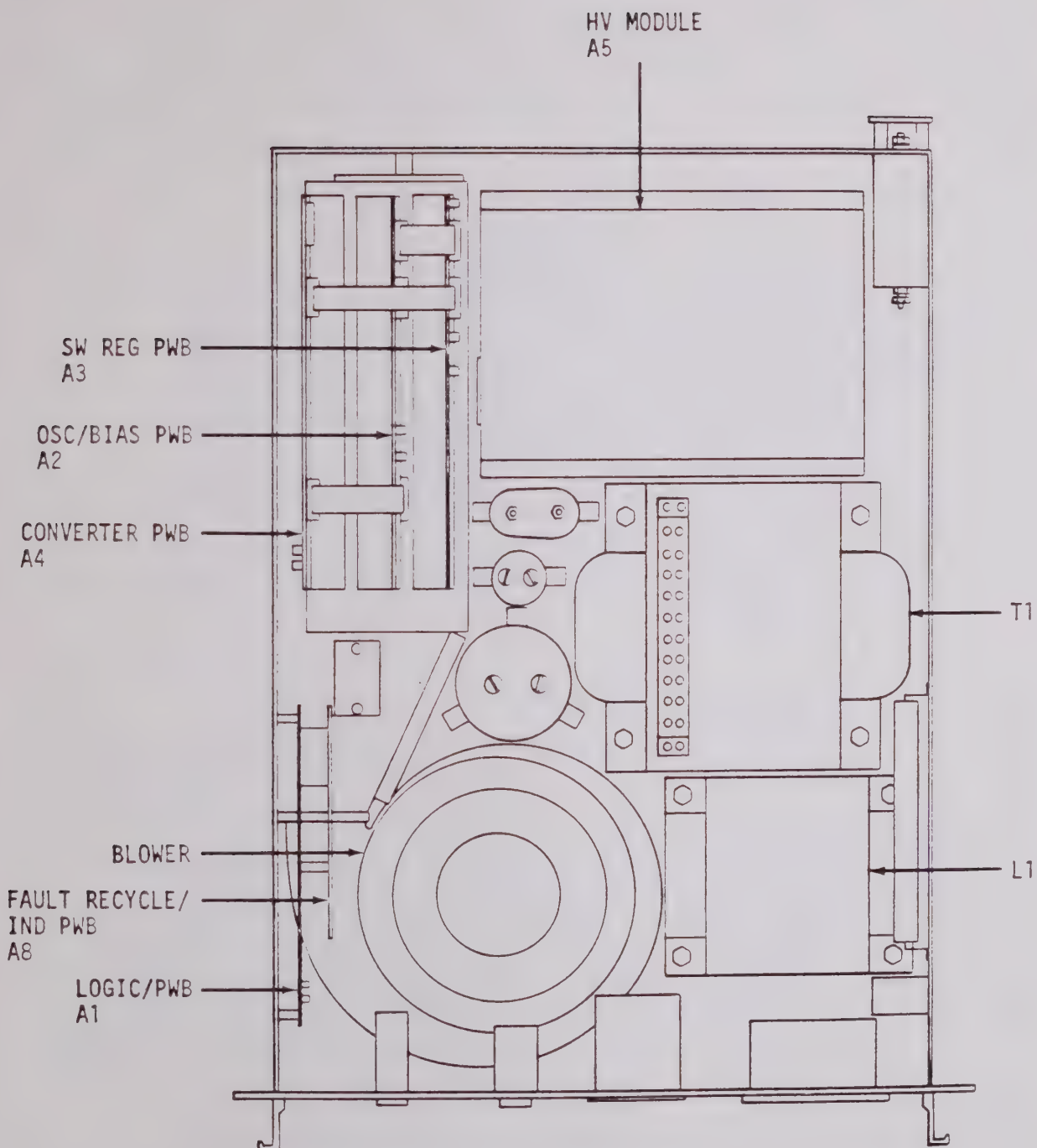


FIGURE 2-4 TOP VIEW GENERAL PURPOSE WIDE BAND TWTA

0896-B/84

2.4.4 Switch Regulator PWB Assembly A3

The Switch Regulator board regulates a 200 VDC bus that feeds the High Voltage Converter which, in turn, feeds the High Voltage Module and the TWT. A sample of the Helix HV output is fed back to the Switch Regulator. This allows close regulation of the total TWT helix and collector voltages.

The Switch Regulator is self-protected against any combination of over/under voltage and short circuit conditions; it is the primary line/load regulating element in the Power Supply.

2.4.5 High Voltage Converter/Heater Supply Assembly A4

The High Voltage Converter board is a bridge circuit providing a 10 KHz, 150-200 VDC square wave to the High Voltage Module. This assembly also contains its own over-current protection and a TWT heater regulator.

2.4.6 High Voltage Module A5

The High Voltage Module is a separate field-replaceable item containing the high voltage transformer, heater transformer, rectifiers and filters for all TWT voltages, and the sense resistors for helix voltage and current. The 200 VAC square wave from the High Voltage converter is fed to the high voltage transformer. The voltage is then transformed to the high voltage levels necessary to drive the TWT. The collector voltage is depressed from that of the helix voltage to optimize the overall amplifier efficiency. Two printed circuit boards are used.

2.4.7 Power Conditioning Circuits

The input power circuitry contains an EMI filter, power transformer, circuit breaker, input bridge rectifier, and filters. It provides complete isolation of the power supply from the input

line voltage and minimizes susceptibility to external interferences. The use of SCRs in the input bridge provides fast shutdown in the event of over-voltage conditions. During normal operation, the SCRs function only as diodes. Output of this section is approximately 250 VDC.

[illegible]

2.5 RF SECTION

The RF Section is located in the bottom portion of the PA (see Figure 2-5).

The standard configuration includes a TWT, RF input and output cables, and integral forced air cooling for the TWT. The RF output of the PA is a function of the specific configuration selected. RF gain varies from 30 to 40 dB for the 100 Watt versions and from 30 to 45 dB for the 200 Watt versions (see Table 1-1).

The RF section accommodates a wide variety of RF configurations from a single TWT with input/output connectors to a sophisticated unit that includes solid state preamplifiers, VSWR protection detectors, RF power meter, isolators, couplers, and filters. See Table 1-2 for the options that are available. Additional special features may also be included upon request.

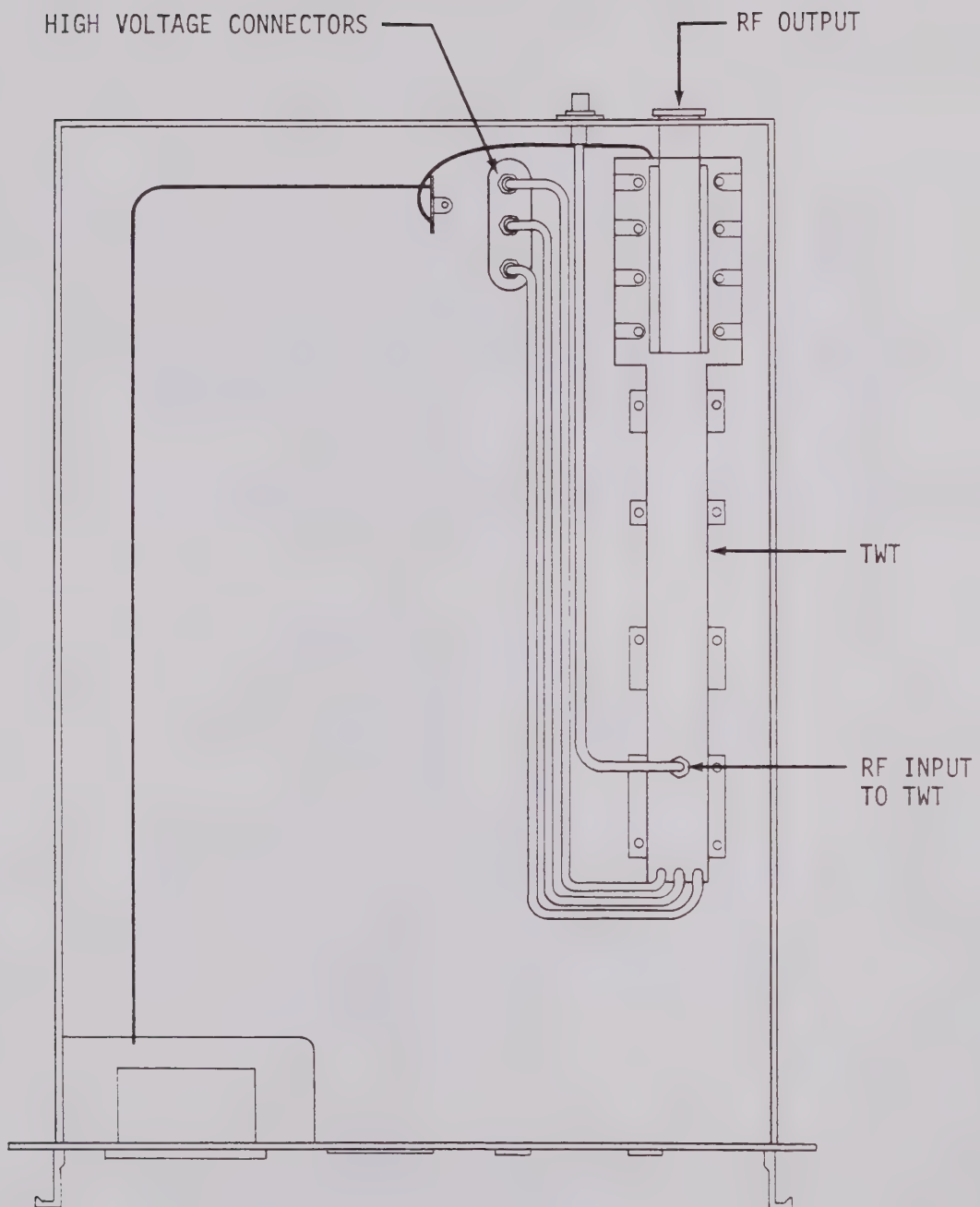


FIGURE 2-5 LOCATION OF RF SECTION

SECTION 3

UNPACKING AND INSTALLATION

3.1 UNPACKING

3.1.1 Pre-Inspection

Before unpacking, inspect the exterior of the packing containers for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the unit and submit a damage report. Failure to do so could invalidate future claims.

3.1.2 Unpacking

Carefully unpack and remove all items. Save all packing material until all inspections are complete. It is recommended that all packing material be saved for potential future use.

NOTE

File the PA Test Data Sheets received with the equipment in a convenient place. They will be needed for some of the maintenance adjustment procedures.

3.1.3 Check Packing Slips

Verify that all items listed on the packing slips have been received.

3.1.4 Post-Unpacking Inspection

Inspect all items for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the equipment and file a claim. Failure to do so could invalidate future claims.

Check the unit thoroughly for damaged or loose parts. To remove the top cover, Loosen the five one-quarter-turn fasteners and lift the cover off. After visual inspection is complete, reinstall the cover and tighten the fasteners.

3.1.5 Pre-Installation Electrical Inspection

A preliminary electrical inspection can be performed at this time. However, due to the complexity of interconnection, it is advised that electrical inspection be performed after installation of the equipment in its final rack assembly. If an electrical inspection is required prior to installation in the final rack assembly, refer to sections 3.2, 3.3 and 4.3 for procedures and verifications. The following basic steps must be completed:

- a. Verify a proper termination on the input and output of the PA.
- b. Verify proper AC prime power connections to the PA.
- c. Follow the initial turn-on procedures as detailed in section 4.3.

3.2 MECHANICAL INSTALLATION

The following procedures should be followed for installation of the PA into the final operational rack assembly.

3.2.1 Rack Installation

The PA is designed for slide mounting in a standard 19-inch wide rack cabinet. The following procedures should be followed:

- a. Locate the PA mounting position in the rack.
- b. Mount the mating slides (supplied) to the rack cabinet. Refer to the outline drawings on the PA included in Section 7 of this manual for exact dimensioning of the rack slide center lines with relation to the unit Front Panel.
- c. Install the PA on the mating slides and securely fasten the Front Panel to the rack cabinet rails.
- d. Once the unit is installed on the slides and fastened to the cabinet, the balance of the installation procedures can be completed.

3.2.2 Waveguide Connection

This section applies only to those models with waveguide connectors. Refer to Table 1-1.

Refer to the outline drawing of the PA located in Section 7 of this manual for the location and exact dimensioning of the waveguide flange. Proceed as follows:

- a. Position the interconnecting waveguide so that it aligns precisely with the waveguide flange at the rear of the PA.
- b. If alignment is not precise, or if the installation is subject to motion or vibration, a flexible waveguide section should be installed between the output of the PA and the interconnecting waveguide.

- ```

CAUTION

Do not overtighten, as this could strip the
threads of the mating flange.

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Operating the PA with unterminated or excessive  
load VSWR could cause destruction of the TWT and  
will void the warranty. The maximum load VSWR  
should not exceed 1.5:1.  
  
*****
```

3.2.3 Air Ducting

The PA is forced air cooled. The exhaust air from the PA may be at a relatively high temperature and heat dissipation may be as high as 2000 Watts. In order to prevent heat buildup in the rack cabinet, the exhaust air should be ducted away from the PA and outside of the rack cabinet. Particular care must be taken to ensure that exhaust air does not circulate back to the amplifier air intake area. If exhaust ducting is not used, a minimum of eight inches of free space should be left at the rear of the PA exhaust port. Suitable cabinet louvers or ventilation must be provided along with high volume cabinet blowers. If exhaust ducting is to be provided, the external ducting must have a cross sectional area at least equal to that of the exhaust opening. Exhaust duct bends and transitions must be smooth and bend radii should be as large as possible.

3.3 ELECTRICAL INTERCONNECTION

Electrical interconnections to the system consist of prime power and ground connections.

3.3.1 AC Prime Power

Prime power requirements for the subsystem is nominal 115 VAC, 50-60 Hz. Prime power must be single-phase, three-wire, with the third wire for earth ground. The wiring for 230 VAC prime power is shown in Figure 3-1. When Option K is specified, the unit is factory wired for 230 VAC. 12 gage or larger wire (as defined by UL 817) shall be used to apply prime power to the system. Power is applied to barrier terminal strip TB1 located on the Rear Panel of the PA. The terminal strip is designed for terminal lugs using #10 screw terminals. Prime power is applied to terminals 1 and 2 of the TB and the earth ground wire is supplied to terminal 3 of the TB (see Figure 2-2).

3.3.2 Grounding

It is necessary for personnel and equipment safety to securely ground the amplifier to earth ground. The ground connection is located on the rear of the PA. This should be securely connected to prime power ground and tied to a ground bus tie point in the rack cabinet assembly.

3.3.3 Remote Interface (Option G)

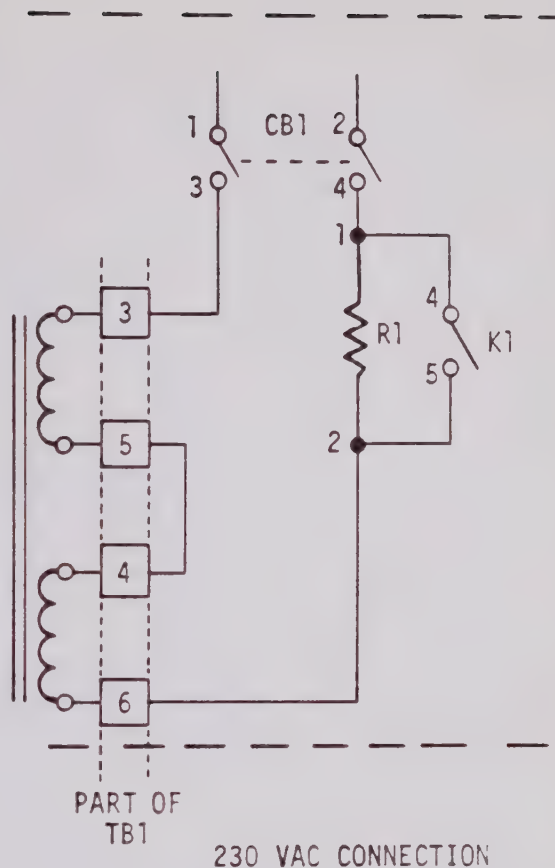
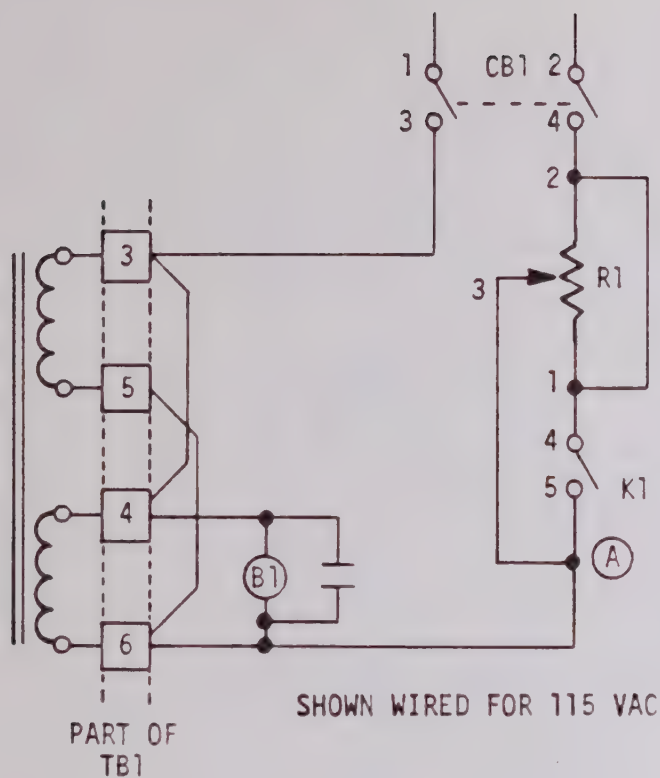
The Remote Control Interface connector provides an interface between the PA and remotely located customer status indicators and controls. As shown in Figure 3-2, remote status indicators can be actuated through relay contacts on J3-2, 3, 4; J3-5-6, 7, J3-8, 5, 10 and J3-11, 12, 13. High voltage can be remotely controlled by a switch between J3-16 and J3-21.

NOTE

Either a jumper or a normally-closed, remote interlock switch must be installed between J3-15 and J3-20.

3.4 REPACKAGING FOR SHIPMENT

The instructions given below are intended as a general guide for repackaging the PA for shipment. A detailed instruction on returning goods may be found on the back of the warranty sheet at the back of this manual. If you have any questions, contact the Varian field office in your area for assistance.



LINE VOLTAGE	CONNECTIONS	
	TRANSFORMER T1	RESISTOR R1
115 VAC	REMOVE JUMPER 4, 5 PUT JUMPERS BETWEEN 3 AND 4 AND BETWEEN 5 AND 6.	WIPER (R1-3) CONNECTED TO POINT A. JUMPER BETWEEN R1-1 AND R1-2.
TO CONVERT TO 230 VAC	REMOVE JUMPERS BETWEEN 3-4, 5-6, REPLACE WITH JUMPER FROM 5 TO 4.	MOVE WHITE WIRE CONNECTION FROM R1-3 (WIPER) TO R1-2. REMOVE JUMPER BETWEEN R1-1 AND R1-2. TRANSFER RED WIRE (CB1-1B) FROM R1-2 TO R1-1.

FIGURE 3-1 230 VOLT CONNECTIONS

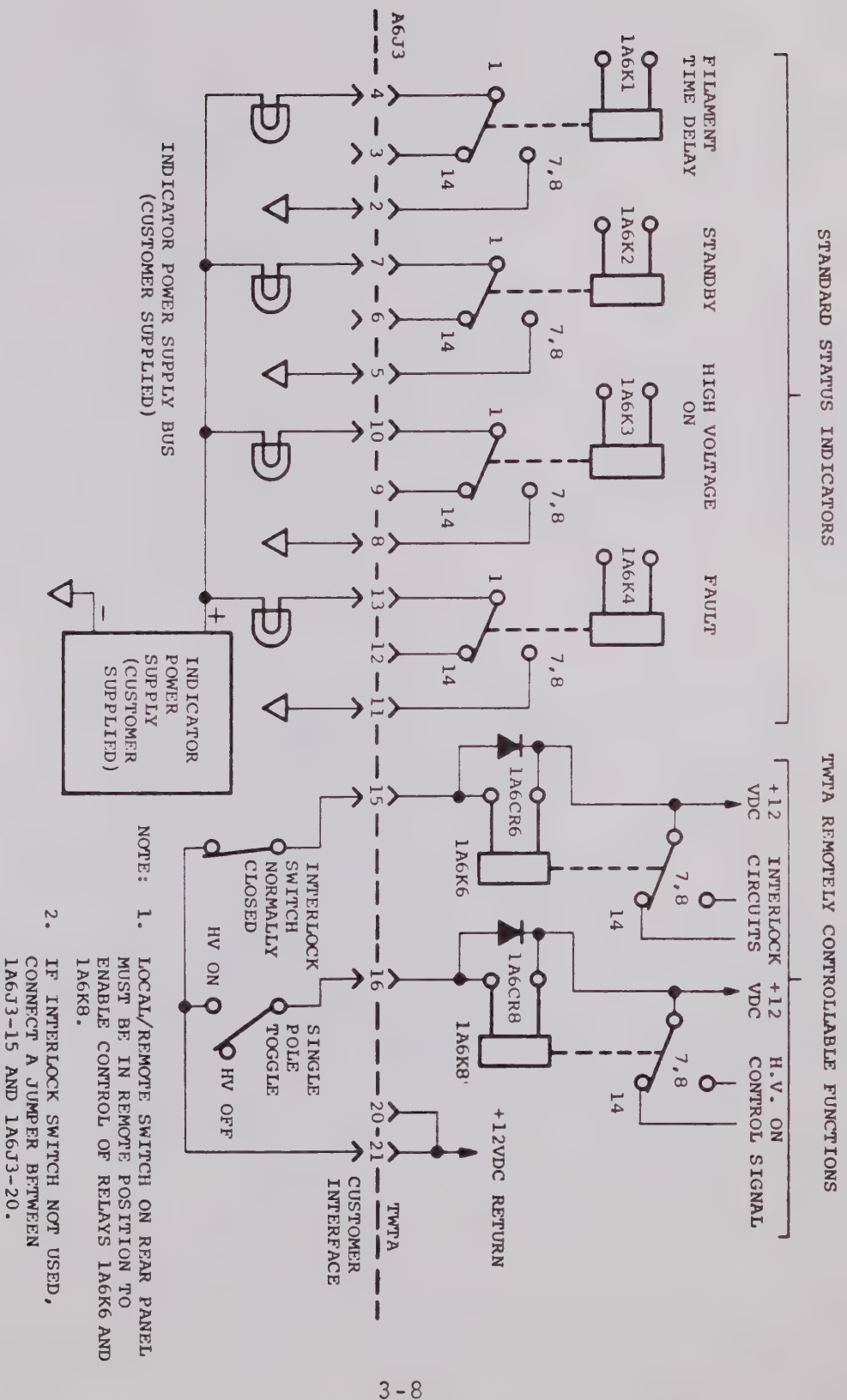


FIGURE 3-2 TYPICAL REMOTE CONTROL INTERFACE CONNECTION

3.4.1 Snipping Container

Place the equipment in the original shipping container, making sure that there is adequate packing material around all sides of the system and that the front panels are protected with thick cardboard strips. If you do not have the original container, use heavy wooden boxes with adequate protection.

3.4.2 Sealing Container

Seal the shipping containers with nails or metal bands.

3.4.3 Marking

Write the words "Fragile", "Delicate Instrument", etc. in several places on the outside of the snipping container.

NOTE

If the equipment is to be shipped to Varian for service or repair, attach to it a tag identifying the owner. Also indicate the service or repair desired, the problems encountered and any other information that would be of value to the service facility.

In all applicable correspondence refer to the unit by both the model number and serial number.

Please use the following shipping address for all returned products:

VARIAN ASSOCIATES
Microwave Equipment Division
3200 Patrick Henry Drive
Santa Clara, California 95054
Atten: Customer Support

SECTION 4

OPERATION

4.1 GENERAL

This section describes the normal operation of the Varian 6900G Series, General Purpose, Wide Band, Power Amplifier (PA). The operating modes, the controls, indicators and meters, and the turn-on and turn-off procedures will be explained. All controls used in normal operation are located on the front panel of the PA. Status and fault indicators provide displays of status of the unit at all times.

4.2 OPERATING MODES

There are four operating modes for the unit including: Time Delay, Standby, Beam On, and Fault.

4.2.1 TIME DELAY

When the TIME DELAY indicator is lighted, the power supply is providing only heater power to the TWT. The helix and the collector voltages are inhibited during the time delay. The power supply enters this mode immediately when the power is switched to ON and remains in this mode for approximately three minutes to allow the TWT heater to reach its proper operating temperature. The STANDBY or BEAM ON indicator will then light depending on the position of the OPERATE/OFF/RESET switch.

The time delay circuitry provides for proportional time delay in the event that a prime power failure occurs. If the OPERATE/OFF/RESET switch is in the OPERATE condition and a prime power failure occurs, then when prime power is restored, the TWT will cycle in a time delay proportional to the length of time of the power failure. The high voltage will then automatically turn itself on after time delay. If the high

voltage is in the OFF condition at a power failure, then the TWTA will cycle in time delay proportional to the power failure and stop in a STANDBY mode.

4.2.2 STANDBY

This mode is indicated by only the STANDBY indicator being lighted. In this mode, only filament voltage is applied to the TWT and high voltage can be applied by pressing the operate switch. Standby is defined as no filament time delay, high voltage off and no faults existing.

4.2.3 BEAM ON-High Voltage On

The BEAM ON indicator lights whenever the OPERATE/OFF/RESET switch has been set to OPERATE and high voltage is on, i.e., the collector and helix voltages are applied to the TWT.

4.2.4 FAULT

The Fault mode is indicated by the FAULT indicator being lit. The FAULT indicator is a summary alarm. The following faults cause the FAULT indicator to light: high helix current; TWT overtemperature; internal interlock, undervoltage for -200V, -200V overvoltage and HV converter overcurrent. The FAULT indicator also indicates a lockout condition. The OPERATE/OFF/RESET switch must be set to OFF/RESET to reset the fault and then set to OPERATE again to enter a BEAM ON condition.

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WARNING  
  
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LETHAL VOLTAGES UP TO 15KV ARE PRESENT IN THE POWER  
AMPLIFIER WHEN IT IS OPERATING. USE EXTREME  
CAUTION WHEN WORKING INSIDE THE UNIT. AS AN ADDED  
PRECAUTION IT IS RECOMMENDED THAT ANOTHER PERSON  
BE PRESENT TO GIVE AID IN CASE OF ACCIDENT.  
  
*****
```

4.3 METERS, CONTROLS AND INDICATORS

Figure 4-1 shows the Front Panel of the standard TWTA.

4.4 INITIAL TURN-ON

Initial Turn-On differs from normal turn-on in that certain precautions must be taken to protect the Power Amplifier against damage from unknown conditions. Once proper overall operation is verified in the final installation, turn-on and turn-off can be accomplished as described in subsequent sections.

4.4.1 Pre-Power Check

Before applying prime power to the system, verify that the following conditions are met:

- a. The available prime power voltage must be within the ratings of the amplifier and that the interconnections in the amplifier have been made for the appropriate input voltage.
- b. The output must be terminated in a load capable of dissipating the rated CW power or more at the intended operating frequency.

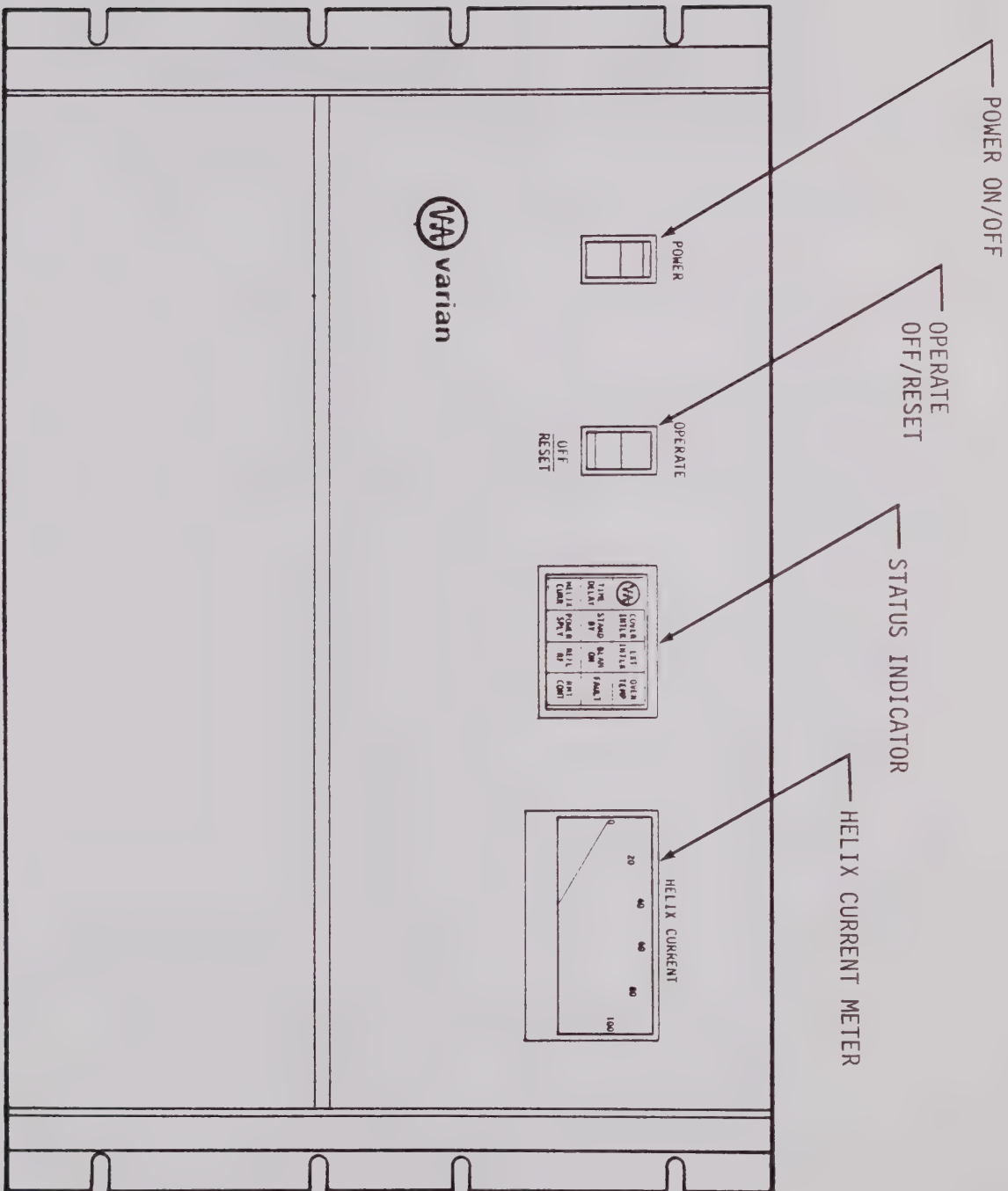


FIGURE 4-1 FRONT PANEL CONTROLS/INDICATORS

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- c. The load VSWR over the rated frequency range is less than 1.5:1.
- d. The RF drive source frequency falls within the rated frequency range and has a level that will not allow excessive overdrive.
- e. The rear exhaust air duct and air intake duct from the TWT assembly are not blocked.

```

*****
*                                     *
*                               *****                               *
*                               CAUTION                               *
*                               *****                               *
*                                     *
* Failure to observe any of the above conditions can                *
* cause catastrophic damage to the unit and will                    *
* void the warranty.                                                  *
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4.4.2 Turn-On Sequence

- a. Set the input power level to minimum output level.
- b. Place the Power Switch in the ON position. Verify that the VA LOGO indicator lights. Verify that the TIME DELAY indicator is lighted. No readings should be obtained on the melix current meter at this time.
- c. Approximately three minutes after power is applied, the TIME DELAY indicator should turn-off, and the STANDBY indicator should light.

- ```

 CAUTION

Prior to performing step e., check the TWTAs data sheet to determine the proper RF drive level. Do not exceed this level by more than 6 dB. Overdrive of the TWTA could cause damage to the equipment.


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- The power amplifier is now ready for operation.

#### 4.5 NORMAL TURN-ON

Once the steps defined in Section 4.3 have been completed, normal turn-on can be accomplished very simply, unless there is reason to suspect that a significant change in operating conditions has occurred during the off time. The following steps may be used if a normal turn-off procedure has been followed.

- a. Place the Power Switch in the ON position and verify that the LOGO and TIME DELAY indicators are lighted.
- b. When the heater time delay is complete, verify that the TIME DELAY indicator turns-off and that the STANDBY indicator lights. Set the OPERATE/OFF/RESET switch to OPERATE and verify normal helix current.
- c. If automatic turn-on is desired, the OPERATE/OFF/RESET switch should have been set to OPERATE prior to turn-on. In this mode, when the heater time delay is complete, the unit will automatically return to full operation with high voltage ON and RF output.
- d. Apply RF drive to obtain the desired output power.

#### 4.6 TURN-OFF

If the Power Amplifier is to be turned-off for less than two hours, it should be placed in STANDBY by setting the OPERATE/OFF/RESET switch to OFF/RESET. This permits the blower to run and minimizes thermal and electrical shock on the heater. If the off-time is to be extended, the unit should be turned-OFF completely to save heater life and prime power.

- a. Set the OPERATE/OFF/RESET switch to OFF/RESET to turn high voltage OFF.
- b. Let the system run in the STANDBY mode for several minutes in order to cool the TWT and all other components.
- c. Place the Power Switch in the OFF position to remove prime power from the unit.
- d. If automatic return to full operation is desired on subsequent turn-on, the OPERATE/OFF/RESET switch may be left in the OPERATE position when the main power is turned OFF. This operation is permissible but is generally not recommended, because it produces a thermal rise in the TWT at turn-off, and because turn-on will occur without an operator verifying that proper operating conditions exist.

#### NOTE

This PA is equipped with fast response fault detection circuits. If you "flip" the OPERATE/OFF/RESET switch from OPERATE to OFF/RESET and back on again you may induce faults. When you turn the BEAM off, wait one second before returning to OPERATE again. If there is a fault indication after a very short prime power interruption, this is normal and the Fault Recycle and Indicator PWB A8 will automatically clear such faults.







## SECTION 5

### THEORY OF OPERATION

#### 5.1 GENERAL

This section describes the Theory of Operation for the 6900G Series, 100 to 200 Watt, General Purpose, Wide Band PA with a full set of options and special features incorporated in the unit. The options and special features include:

- a. Choice of prime power
- b. Local or remote operation
- c. Fault recycling
- d. High load VSWR protection
- e. Elapsed Time Metering of TWT

#### NOTE

Your PA probably does not include every option and special feature. Check Section 1 and Section 7 for specific configuration data on your unit.

Understanding the Theory of Operation is a necessity for the technician who will maintain the equipment, and an asset for the operator. A thorough understanding of the Theory of Operation of the equipment provides for a more efficient operation, and quicker and more effective repairs if problems develop. This section should be completely understood by any individual performing maintenance on the system.

## NOTE

Unless noted otherwise, the reference designators used in a particular section relate to the unit being discussed. Since there are identical reference designators on various PWBs, reference designators for assemblies other than the one being discussed carry the assembly designator. For example: 1A7C1 would refer to capacitor C1 on the A7 assembly.

## 5.2 POWER SUPPLY

### 5.2.1 Basic Design Concept

The Power Supply design is based on proven reliable circuits that have been used on numerous communication ground station and amplifiers. A functional block diagram of the Power Supply is shown in Figure 5-1. Design efficiency and reliability are obtained by using a switch regulator approach for primary regulation. Optimum regulation and RF performance are obtained by the use of direct feedback (helix voltage sense) from the high voltage DC output to the switch regulator. Over-current/under-voltage protection circuits are incorporated in the heater and helix/cathode supplies to prevent damage to them in the event of a failure in the TWT and to prevent damage to the TWT in the event of a power supply failure.

The Power Supply is mounted on a 1/4 inch thick aluminum baseplate and occupies the upper eight inches of the overall height of the unit; this arrangement allows rapid, easy access for maintenance and service of the unit. The bulk of the circuitry is on printed wiring boards (PWBs) that are interconnected by flat cable assemblies or screw terminal connectors to various components.



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The following description uses simplified circuit diagrams for illustrative purposes. Up-to-date detailed schematics for the PA, the Power Supply, and the various printed wiring boards are included in Section 7. The applicable schematics are referenced as the A3 schematic, the A5 schematic, etc. The specific drawing numbers of these schematics are listed at the beginning of Section 7 and the drawings are arranged in numerical order.

### 5.2.2 Power Conditioning

The power conditioning circuits interface with the AC prime power<sup>(1)</sup> source; they control and protect the application of prime power to the PA and transform the AC input into a DC voltage that is fed to the switch regulator. A schematic of the power conditioning circuits is shown as part of the UDI schematic.

The prime power connection is made at TB2 which is located on the rear panel of the PA and is part of the RFI Filter FL1. The output of FL1 feeds a two-pole, single-throw circuit breaker (CB1) which is used to control application of prime power to the rest of the PA. CB1 applies prime power to transformer T1 through a surge limiting circuit consisting of resistor R1 and a set of relay contacts on relay K1. Relay K1 is controlled by Oscillator-Bias PWB A2. Upon application of power, R1 limits the turn-on surge current to less than 300% of normal operating current. K1 energizes and shorts out R1 in less than one second.

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(1) See Table 1-2 for prime power options.

Blower B1, in the 115 VAC configuration, is connected in parallel with the primary windings. B1 is connected across one of the primary windings when the TWT is wired for 230 VAC operation (see Figure 3-1).

The output of secondary 1 of transformer T1 is 38 VAC. This output is connected to the Oscillator/Bias PWB A2 where it is rectified and processed to generate a -38 VDC unregulated supply and a -30 VAC unregulated supply. (See Section 5.2.3.1).

The output of secondary 2 of transformer T1 is 275 VAC. This output is fed to SCR bridge rectifier CR1. In normal operation, CR1 acts like a conventional bridge rectifier. The major difference between CR1 and conventional bridge rectifiers is that two SCRs are incorporated in the device. A positive signal on the SCR gates (G1, G2) will cause the SCRs to conduct.

Once the SCR fires, it will not turn-off until the applied voltage is reversed or removed. Since the applied voltage (275 VAC) reverses every half cycle, removal of the gate signal allows the SCR to turn-off within one cycle. This allows fast acting control of the primary supply voltage of the PA if a fault occurs. (See Section 5.2.7.5 for a discussion of fault detection circuits). CR1 is also used to limit the maximum DC voltage to the switch regulator during light or no-load conditions. See Section 5.3.2.5 for a full discussion of this circuit.

The output of CR1 is filtered with inductor L1 and capacitor C1 which results in an unregulated -250 VDC nominal output. The -250 VDC output is fed to Switch Regulator A3 which, in turn, feeds the high voltage circuits (See Section 5.2.4).



### 5.2.3 Oscillator/Bias PWB Assembly A2

As shown in Figure 5-1, the Oscillator/Bias PWB performs a variety of functions. A block diagram of the Oscillator/Bias PWB is shown in Figure 5-2. Circuit details are shown in the A2 schematic. The functions included on the board are:

- a. -38 VDC Supply, unregulated
- b. -30 VDC Supply, regulated
- c. 29 VAC Supply, 10 kHz square wave
- d. +5 VDC Supply
- e. -5 VDC Supply
- f. +15 VDC Supply
- g. +12 VDC Supply
- h. Sync signal for Switch Regulator and Converter

#### Drive

- i. -250 VDC Bleeder Circuit
- j. -250 VAC No-Load Regulator
- k. -200 VDC Overvoltage Protection
- l. Surge limit and -250 VDC Undervoltage Protection
- m. -38 VDC Undervoltage Protection
- n. -200 VDC Undervoltage Protection

5.2.3.1 Service Voltage Supplies. A block diagram for the circuits that generate the various service voltages (-30 VDC regulated, -12 VDC regulated, +5 VDC, +15 VDC, +12 VDC and 29 VAC) is shown in Figure 5-2. As noted in Section 5.2.2, the power conditioning circuit transformer is used to step the 115/230 VDC 50 to 60 Hz prime power down to 38 VAC. This is the source voltage for the service voltage supplies. The -38 VAC is converted to -38 VDC by full-wave rectifier CR1 and filtered by C1. The -12 VDC supply voltage required for operation of the 20 kHz square wave sync. generator is taken from zener diode CR2 and capacitor C2 which operate directly from -38 VDC. The -38 VDC is monitored by an undervoltage protection circuit (see Section 5.2.3.5) and fed to a precision series regulator consisting of Q1, Q2, Q3, Q4, Q5,



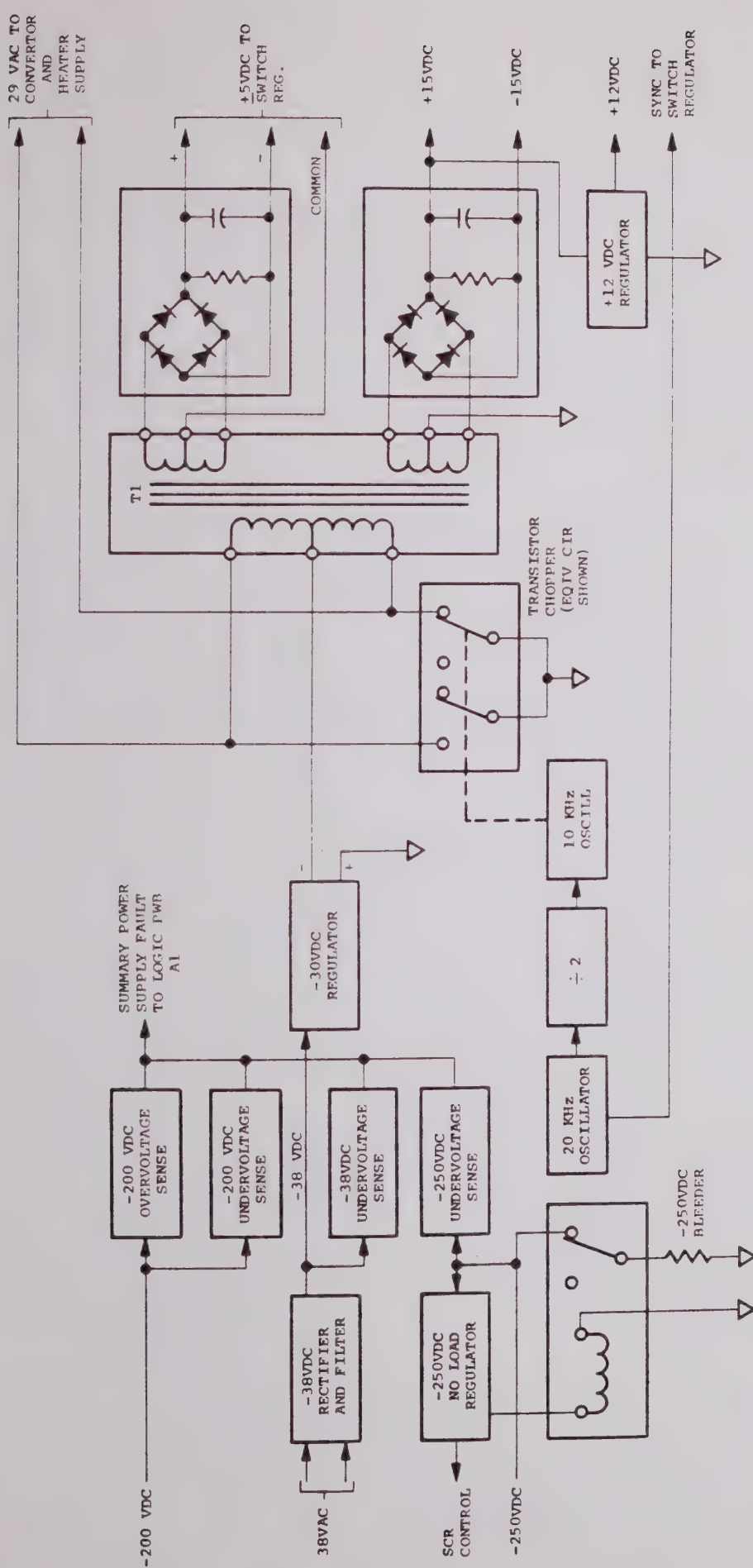


FIGURE 5-2 FUNCTIONAL BLOCK DIAGRAM-OSCILLATOR BIAS PWB A2

and A1 with their associated parts. The output of this regulator is -30 VDC (regulated voltage) which is converted to a 29 VAC 10 kHz square wave. The 29 VAC voltage is used to power the TWT filament supply and to drive the other low voltage supplies required for operation of the TWT. The low voltage supplies are conventional full-wave rectifier circuits driven by the secondary of transformer T1. The +12 VDC supply for the control, logic, and protection circuits is obtained by using a standard 3 terminal regulator with internal short protection.

The 38 VDC is series regulated by Q2, A1, and their associated parts. Q2 is the pass transistor with Q3 connected as a complimentary Darlington. Q1, R1, R2, R5, CR33, CR34 form a constant current driver for the Darlington pass transistors. The drive current is 5 mA set by the value of R5. R10, R11, Q4, C4 are the load current limit circuit. R10 determines the limit point which is 2.5 to 3 amperes. R1, R2, R9 and CR6 are a fold-back circuit which goes into effect when the output voltage of the regulator drops below the voltage at junction of R1 and R2 (approximately 25 volts). When a short circuit occurs, the current limit point drops to about 1 ampere or less. A1, with its associated sense resistors R18 and R19, form a regulator which controls the drive current for Q3 to maintain regulation at -30 VDC. A1 generates a precision +7.15 VDC reference voltage at pin 4 which is referenced to the -30 VDC line. This is compared with a sample of the -30 VDC at pin 3 of A1. The difference between pins 2 and 3 of A1 is amplified by A1 and applied to a transistor that is internal to A1. This internal transistor controls the drive current to Q2 and Q3. R12 and C7 are a compensating network used to obtain stable operation. C5 is the -30 VDC line output filter.

Transistor Q5 is used as a zener diode in which the base to emitter junction acts as a zener diode of approximately 8 VDC with the collector to base junction forward biased.

The operation of the 10 kHz chopper circuit is described in Section 5.2.3.2.

5.2.3.2 Sync and Converter Drive Circuits. The Oscillator/Bias PWB includes circuits that generate 20 kHz voltage; convert the 20 kHz voltage to a 10 kHz voltage; and convert the -30 VDC regulated voltage to a 29 volt 10 kHz voltage. A functional diagram of the related circuits is shown in Figure 5-3; a timing and wave form chart is also included.

The square wave generator produces a 20 kHz square wave that is used to drive the switching regulator. This voltage is also converted from 20 kHz to 10 kHz and used to convert the -30 VDC supply voltage to a 10 kHz, 29 VDC voltage that is the supply voltage for the low voltage supplies discussed in Section 5.2.3.1 and the filament supply (Section 5.2.5.1). The 20 kHz voltage is converted to two symmetrical 10 kHz square waves by one-half of a dual "D" type flip-flop (U2B) at pins 1 and 2. The other half (U2A) is connected as a one-shot, multi-vibrator using R32, C12 and CR14. A 5 microsecond pulse is developed at pin 12 of U2A at a 20 kHz rate. The 10 kHz square wave is "NANDED" with this signal by U1C and U1D. The outputs at U1-10 and U1-11 are out-of-phase quasi-square waves with 5 microseconds of dead time that minimizes losses due to charge storage time in the HV bridge converter transistors. The out-of-phase 10 kHz square wave outputs of U1C and U1D (U1-10 and U1-11) are fed to push-pull transistors Q11 and Q12 through drivers Q9 and Q10. The center tap of transformer T1 (T1-2) is connected to -30 VDC. The output of the converter chopper is a 29 VAC (10 kHz) voltage that is applied to transformer T1 to develop the low voltage supplies and through an isolation transformer to a full wave bridge rectifier in the HV module to develop the filament supply voltage.



5.2.3.3 -250 VDC Regulation and Protection. The -250 VDC supply voltage generated by the power conditioning circuits is regulated to limit its magnitude to less than 300 volts and monitored to shut down if the magnitude falls below -160 volts. Circuit elements are also incorporated to discharge the -250 VDC filter capacitor (C1) whenever the power supply is turned-off and to inhibit surge currents in the primary of transformer T1 (See Figure 5-4). The over-voltage regulation and under-voltage protection circuits are very similar in that a comparator is used to control a transistor which controls an element that performs the desired function (See Figure 5-4).

5.2.3.3.1 No-Load Regulator: The No-Load Regulator limits the magnitude of the -250 VDC supply voltage during turn-on. The SCRs included as part of CRI on the chassis are the control devices. With no drive signals to the SCR gates, the -250 VDC is turned-off. Q6 controls the SCR gates. During normal (-250 VDC) operation, transistor Q6 conducts which impresses a positive voltage on the SCR gates through resistors R3, R4, R7, R8 and R22. This allows the SCRs to turn-on and act as normal diodes. The voltage at A2 pin 2 is the reference voltage of approximately +6 VDC. Whenever the sense voltage at A2 pin 3 goes negative with respect to pin 2, A2 pin 8 goes positive and turns-off Q6 which disables the 250 VDC. R26, R30, R31 is the sense circuit. R26 allows positive feedback to provide some hysteresis for clean on-off switching. During no-load conditions, when the -250 VDC actual magnitude exceeds -300 VDC, Q6 disables the SCRs. The -250 VDC then decays until the magnitude reaches approximately -295 where Q6 turns-on. The voltage magnitude then rises to -300 VDC and is turned-off again. The action repeats so that the voltage appears as a sawtooth wave going between -295 VDC and -300 VDC.



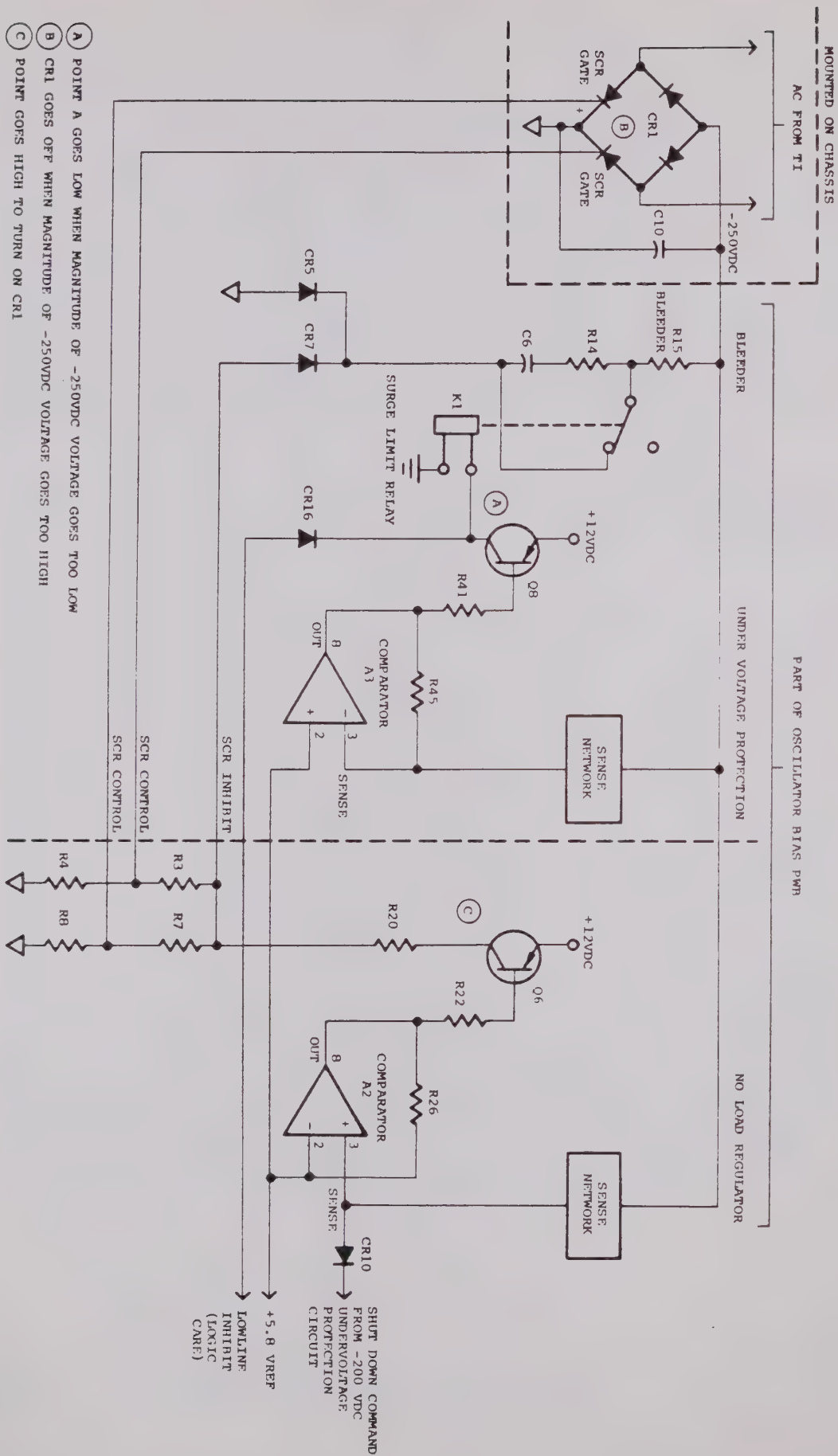


FIGURE 5-4 FUNCTIONAL BLOCK DIAGRAM -250VDC REGULATION AND PROTECTION



5.2.3.3.2 Undervoltage Protection and Surge Limit Relay Control: This circuit provides two functions:

- a. Shuts down high voltage if the magnitude of the -250 VDC input is too low.
- b. Limits inrush surge current during initial turn-on.

Operational Amplifier A3 is used as a comparator. A reference voltage is applied to pin 3 of A3 by Zener CR8 and resistor R47. Pin 2 of A3 is held at +12 volts when there is no -250 VDC supply voltage. Until the -250 VDC value reaches the proper value, pin 2 is positive with respect to pin 3 and the output of A3 on pin 8 is high which holds Q8 off. When pin 2 is negative with respect to pin 3 the output on pin 8 goes low turning Q8 on.

Q8 provides the drive current for surge Relay K1 located on the chassis. A normally open set of contacts on Relay K1 are connected across surge resistors R1 which is in series with the primary winding of transformer T1. When Q8 turns-on and actuates Relay K1, these contacts short out R1.

When the magnitude of the -250 VDC supply drops to about -160 VDC, the output (pin 3) of A3 will go high, Q8 will turn-off, and relay K1 will be de-energized.

Anytime Q8 is off, the low line inhibit is driven low via A3CR16. This line control High Voltage control latch U10D on logic PWB A1. This means that high voltage is turned-off and the surge resistor is enabled any time the magnitude of the DC input into the switch regulator falls below 160 VDC (See Figure 5-4).

5.2.3.3.3 Bleeder Circuits: A bleeder circuit is provided to discharge the -250 V capacitor C1 located on the chassis when prime power is removed. The bleeder circuit path consists of R15 through K1 contacts and CR5. When the -30 volts supply is activated, relay K1 is energized through CR9. The shunting action of the contacts of relay K1 is thus removed and R14 and C6 are connected in series with R15. During the discharge period, CR7 pulls the gates of the power conditioning circuit bridge rectifier SCRs negative disabling the no-load regulator, turning-off the -250 VAC supply. When primary power is interrupted, C8 keeps K1 energized for a few seconds to prevent the bleeder from being connected during short term power outages.

5.2.3.4 -38 VDC Under-Voltage Protection. A comparator (A4) is used to monitor the -38 VDC voltage and generate a HV turn-off signal when the magnitude of the voltage drops below approximately -30 VDC. CR23 establishes a reference input of 5.8 VDC to A4-2. R57 and R59 sense the -38 VDC and connect to A4-3. This point is normally approximately +4 VDC. When the magnitude of this input reaches approximately +5.8 VDC, A4 will fire and A4-8 will go low. This pulls the low line inhibit output at J2-13 low through CR17 which pulls down the HV control logic line for a logic HV turn-off command.

5.2.3.5 -200 VDC Under-Voltage Protection. This circuit also uses a comparator (A5) to monitor the voltage level and performs two functions:

- a. A5 provides a HV turnoff signal to the logic PCB if the -200 VDC drops to a magnitude less than -110 VDC.
- b. It gives a visual indication via an LED which is located on the PCB when a -200 VDC under-voltage occurs.

The -200 VDC is sensed via R70 and R71 and connected to A5-3. This is compared with a reference of +6.2 VDC set by zener diode CR38 and connected to A5-2. When something causes the magnitude of the -200 VDC supply to drop below -110 VDC (such as a short circuit), the input to A5-3 rises above 6.3 V. This causes the internal output transistor in A5 to turn on and provide an output at A5-6 which turns-on SCR CR27. Once turned-on, CR27 remains on regardless of gate voltage and provides a path for LED CR26 to illuminate. The summary fault line (PS FAULT) at J2-4 is pulled low through CR25.

A voltage reference of +5.8 VDC is established by R68 and CR38. The voltage sense circuit consists of R69, R70 and R71. In the standby mode, the HV control switch through CR29 holds A5-3 low and inhibits the -200 VDC undervoltage circuit from operating. When the switch is turned-ON, the inhibit signal remains for C19 and R71 time constant. This allows the -200 volts to reach the proper voltage before the circuit becomes enabled.

SCR CR27, which is a latching device, can be reset by a logic low on the automatic reset line through CR33 by turning the high voltage switch off and on or by the fault recycle PCB when this option is present.

#### 5.2.4 Switch Regulator PCB A3

5.2.4.1 General. This function of the switch regulator is to maintain a well regulated approximately -200 VDC bus that drives the high voltage circuits. The -200 VDC referred to throughout the text may actually be any voltage between -140 and -220 VDC and is determined by the TWT helix voltage required and high voltage module connections. This unit also incorporates features to control the HV converter and to respond to external shutdown commands from other circuits. A functional block diagram of the Switch Regulator is shown in Figure 5-5. The power handling circuits are shown in the top

half of Figure 5-5 and the control circuits in the lower half of the figure. Circuit details are given in the A3 schematic in Section 7.

5.2.4.2 Current Limiting Circuits. The current limiting circuits limit output current at approximately 20 amperes. Current drawn by the power switching circuits develops a voltage across R6. This voltage is approximately 150 mV at the current limiting point. This voltage is amplified by A1 to about 3 V which charges up C7 through CR5 and R15. The feedback resistors R5, R7 and R10 set the gain of A1 and determine the discharge time constant of C7. R5 adjusts the limit point from 0 to 20 amperes. C7 voltage is then applied to a threshold detector circuit consisting of A2 and its associated parts. R16 and R17 set the threshold level. R21, a feedback resistor, determines the hysteresis to provide clean on-off characteristics. When the threshold is exceeded, A2-8 pulls to the -250 V bus and diverts drive away from the input to the power switch circuits thus turning-off the power switches. The circuit stays off until C7 discharges through R10, R7, R5, R4 and R6. Then the circuit cycles on again. This will continue until the current falls below 20 amperes. The frequency of operation in the current limit mode is determined by the time constant of C7 and the switch regulator filter constants and is about 11 kHz. CR1 and C1 provide a 6.2 V power supply to operate the current limiting circuit.

5.2.4.3 Power Switching Circuits and Output Filter. These circuits consist of Q4 through Q10, L1 and associated components. They operate as a duty cycle modulated switch and integrator in series with the -250 VDC bus. When drive is diverted from Q8 by the current limiter on the power switch control circuits, operation of the power switch circuits is inhibited and there is no -200 VDC output.

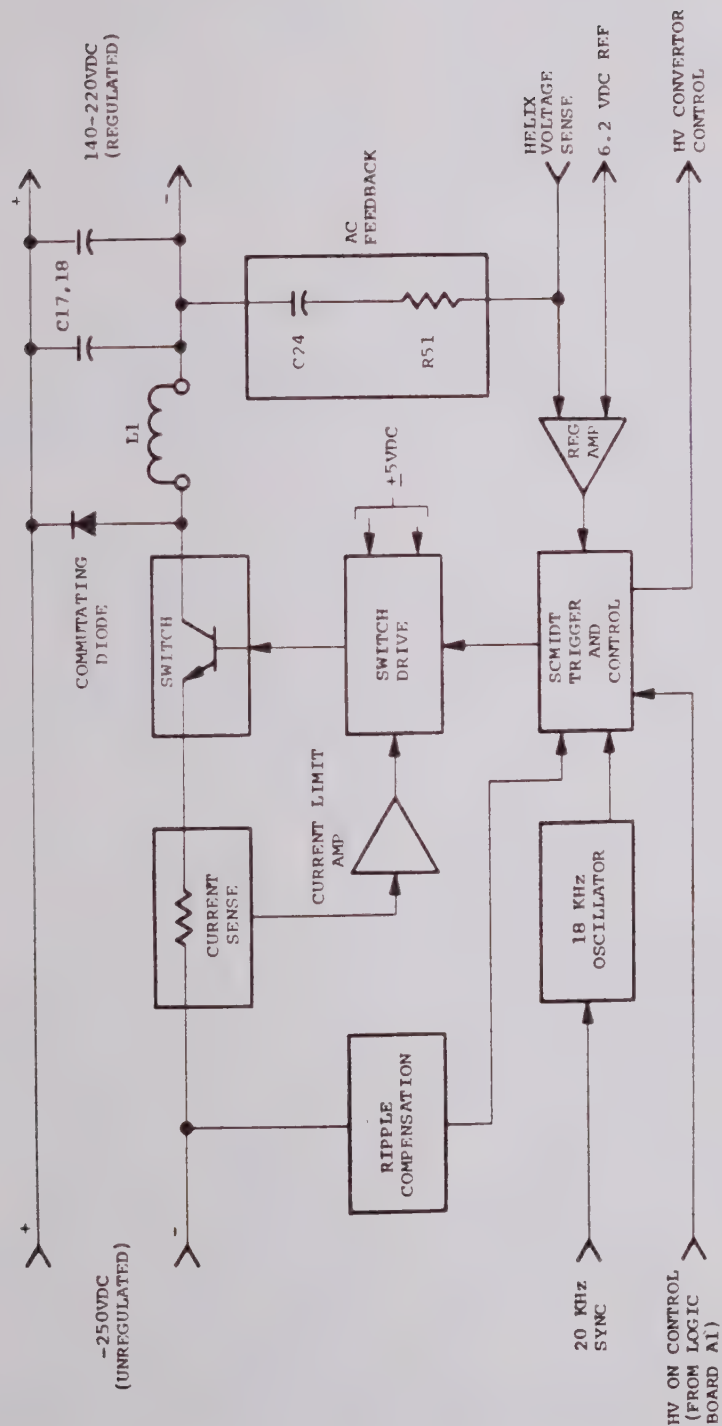


FIGURE 5-5 FUNCTIONAL BLOCK DIAGRAM-SWITCH REGULATOR

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Q6 and Q7 are driven in parallel to switch the -250 VDC bus. Q6 and Q7 in combination with Balun transformer T1 and resistors R39, R40, R41 and R42 form a balanced switching network. T1 provides dynamic current balance between Q6 and Q7 during the portion of time in which switching occurs. The resistor network provides for DC current balance after switching is completed. The result is that, throughout the operation of this circuit, Q6 and Q7 share current equally during on-time.

The output of Q6 and Q7 is a pulse train that is filtered and integrated by the output filter consisting of choke L1, C17, C18. Capacitors C17 and C18 discharge through resistors R47 and R50 respectively during the time when Q6 and Q7 are off.

The ratio of on-time to off-time, in combination with R49, R50 and the load resistance, establishes the DC voltage output of the filter. The -200 VDC output is regulated by the power switch control circuits by varying the on-time/off-time (duty cycle) ratio. This method of regulation is much more effective than traditional series regulation circuits that dissipate power to achieve regulation.

For power efficiency and reliability reasons, it is desirable to cut off Q6 and Q7 very quickly. A snubber circuit is used to momentarily hold the collector of Q6 and Q7 at -250 VDC at the end of an on-time period to allow for stored charge removal in the base to emitter junction. During an on-time period, capacitor C16 charges to -250 VDC through R45. This reflects in a waveform similar to that shown in Figure 5-6. The snubber prevents the energy stored in the filter choke and capacitors from discharging through Q6 and Q7. After Q6 and Q7 are off, the commutating diode CR20 fires and diverts the stored energy. C16 stores enough charge to provide current flow in L1 through CR19 which prevents an inductive pulse at the collectors of Q6 and Q7 until they are turned-off. C15 and R43 attenuate ringing across CR19 caused by R45 inductance.

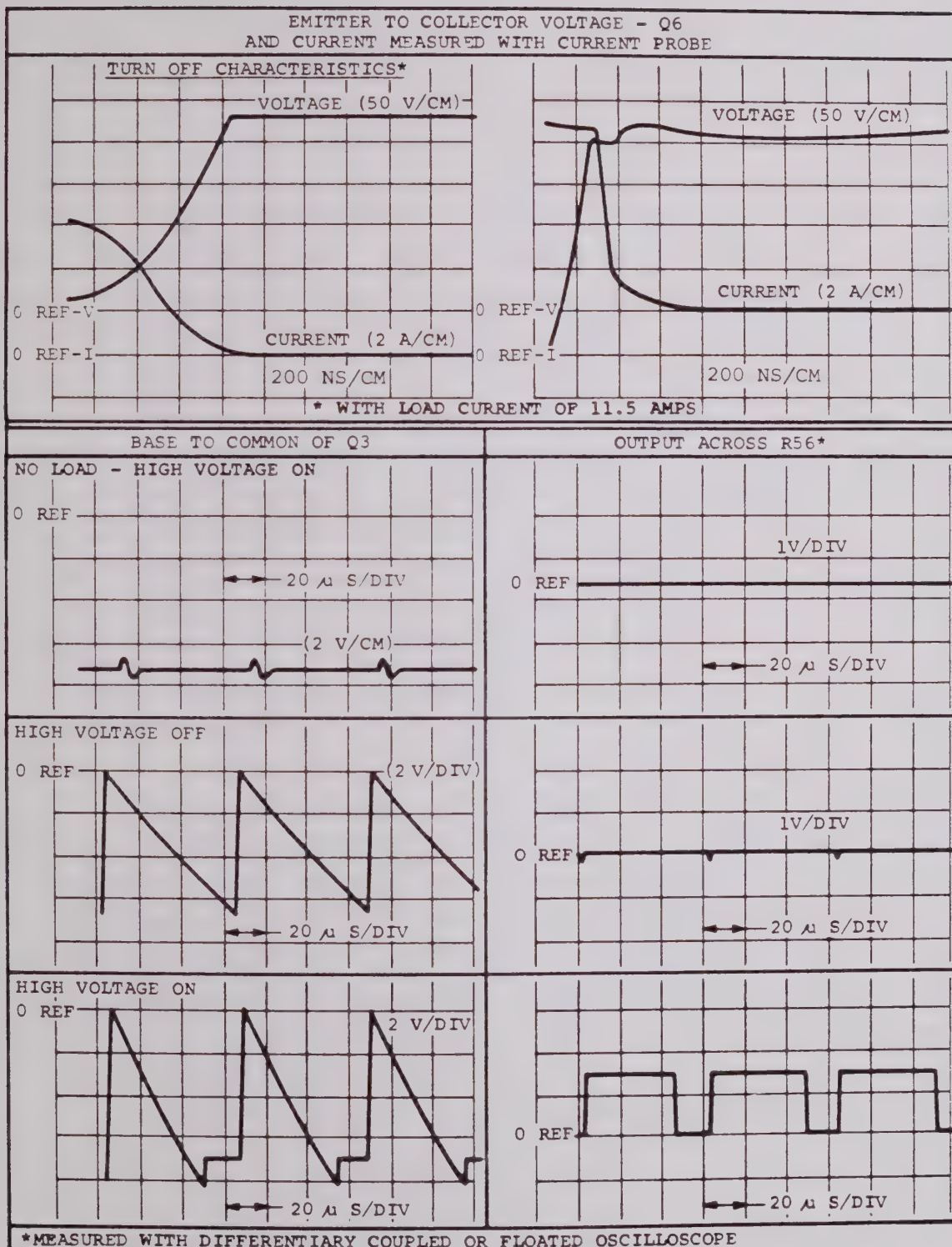


FIGURE 5-6 SWITCH REGULATOR WAVEFORMS

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Q9, Q10, R34, R35, CR17, and CR18 form a current source circuit that provides the base drive (approximately 2A) for Q6 and Q7. Q4, Q6 and CR10 provide a reverse current path for fast turn-off (approximately 0.5 microseconds) of Q6 and Q7. Q5 is biased on by R28 through CR11 and R56. Q10 and Q9 receive their drive through R26 and R30 from Q8. Q5 is turned-off simultaneously with Q8 turning on by having its drive diverted away through CR12. C11 serves to make the circuit less noise sensitive. Q8 is driven by the power switching circuits through a 12 V zener diode, CR14.

5.2.4.4 Power Switch Control. The Power Switch Control is a Schmitt trigger that generates square wave pulses. The power switches (Q6 and Q7) are driven by the Power Switch Control through CR15, CR14 and CR13. CR13 and CR14 combine to shift the -250V supply down to 130 V at Q11. When the input to Q3-B is low, Q11 is on and the power switches have drive applied. Each time the base of Q3 is raised to a voltage of about 7 volts, Q3 turns-on which turns-off Q11 and switches the power switch Q6, Q7 off. Q3, Q11 and their associated parts form a Schmitt trigger. CR8, CR9, R36 and R37 with Q11 form a constant current (approximately 2.5 mA) output stage. R37 also sets the hysteresis of the circuit. CR16 and R38 add 6.2 VDC offset above circuit ground to the Schmitt trigger input Q3-B. U2, an optical coupler, provides a turn-on command to the circuit through Q2, CR7 and R32. No drive can reach the power switches (Q6 and Q7) when U2 and Q2 are off because in this state they open the drive circuit path for and inhibit operation of Q11.

5.2.4.5 Synchronized Oscillator. U1A and B form a free-running oscillator which operates at approximately 18 kHz. The oscillator is then synchronized and drives the power switch control at a pulse rate of 20 kHz. The drive pulses are approximately one microsecond in width.

This oscillator is synchronized by a 20 kHz pulse from the osc/bias circuit. The pulse at pin 12 is applied to pin 6 (the gate of a MOS FET transistor) the drain of which (pin 13) is used to discharge C8 to zero volts once every 50 microseconds. C8 is charged by a current source formed by Q1, R22, CR25 and R19. C8 voltage is applied to the power switch control Schmitt trigger input (Q3-B). When C8 voltage is less than the trigger threshold (approximately 7 V) Q3 is off, Q11 on, which turns-on power transistors Q6 and Q7 through the drive circuits. When C8 voltage reaches threshold, Q3 turns-on, Q11 turns-off which removes drive from the power switch. At the end of about 50 microseconds, U1-13 discharges C8 to 0 and the cycle starts over again. This charge-discharge cycle in C8 and the associated state of Q11 of the power switch control are shown in Figure 5-6.

5.2.4.6 Ripple Compensation Circuits. The ripple compensation circuits help to reduce the output ripple on the -200 V output by a feed forward technique. The combination of Q1, R22 and CR25 acts as a constant current generator to charge C8. The adjustable network of R28, R18 and C20 provide an adjustable charging current for C8 that is proportional to the magnitude of the ripple components on the -250 VDC bus. The charging rate of C8 is inversely proportional to the -200 VDC and ripple so that adjustment of R29 allows the output ripple voltage to be minimized.

5.2.4.7 High Voltage Regulator Circuits. Feedback from the high voltage sensing circuits to A3 provides the signals necessary for good load regulation and temperature stability with very fast reaction times. A3 is an operational amplifier.



A reference voltage of 6.2 VDC is established by R48, CR21 and R58 on A3-2. This is compared to the helix voltage sample from J2-2 across R55 and R53. A3 amplifies this and diverts some of the charge current to C8 proportionally to the error signal between A3-2 and A3-3. This changes the duty cycle on the power switches Q6, Q7 through Q3 and provides a linear regulator loop. The use of these circuits results in as tightly regulated switch regulator output with instantaneous response to input perturbations. C19 and R44, R49 are used to set the loop stability. C24 and R51 are used for test and maintenance purposes and, along with C23 and R48, provide an AC feedback path which increases loop gain at higher frequencies.

#### 5.2.5 High Voltage Converter and Heater Supply PWB

A4 circuit details are presented in the A4 Schematic in Section 7. The functions of this PWB are:

- a. Control of TWT heater supply voltage level (Section 5.2.5.1).
- b. Conversion of regulated -200 VDC input from switch regulator to 200 VAC (square wave) for high voltage transformer in high voltage module (Section 5.2.5.2).
- c. Control of the 200 volt converter operation (Section 5.2.5.3).
- d. Monitor current in primary of high voltage transformer and provide overcurrent protection (Section 5.2.5.4).

5.2.5.1 Heater Supply Control. The operation of this circuitry can be best understood by looking at the entire TWT heater circuit. As shown in Figure 5-7 the heater supply is distributed on three functional elements. These are:



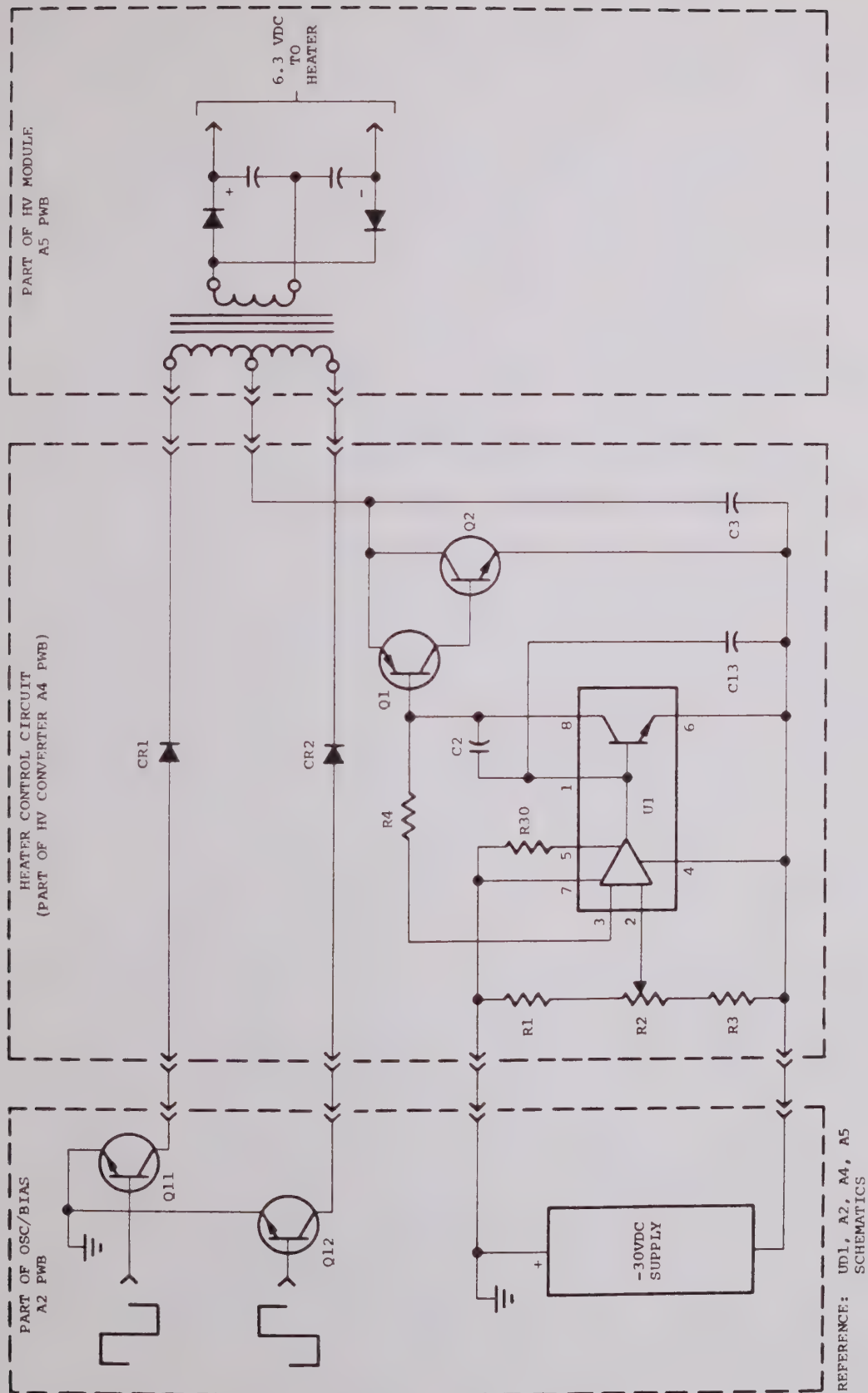


FIGURE 5-7 HEATER SUPPLY

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- a. Osc/Bias Assembly, which generates the -30 VDC and 29 VAC 10 kHz square wave drive. This is discussed in Section 5.2.3.2.
- b. HV Converter (heater control circuit), which provides the active control and adjustment circuits to be discussed here. These circuits control the magnitude of the 29 VAC applied to the HV module.
- c. HV Module, which contains the TWT heater transformer, rectifier and filter circuits. This is further discussed in Section 5.2.6.

R2 sets a reference input to U1-2 that is adjustable between 0.5V and 5.0 VDC. R4 sets the loop gain of U1 to unity so that the output at U1-8 is the same as U1-2. This output is applied to Q1 and Q2 which function as an emitter follower. The DC voltage at Q2-C is than 0.7 VDC higher than the set point of R2 and sets the maximum voltage across T1 primary. The AC current path for T1 is through Q2 and CR1 or CR2 on alternate cycles. Capacitors C2, C3 and C13 are for compensation of the heater control unit.

5.2.5.2 200 Volt Converter. The output of the converter drives the high voltage transformer of the high voltage module. The input to the converter is the regulated DC output of the switch regulator. This input of 140-220 VDC is converted to a 140-220 VAC 10 kHz square wave. Q7, Q8, Q9 and Q10 form a bridge converter that is driven by a 29 VAC 10 kHz signal on the primary of Transformer T1. In operation, Q7 and Q10 are driven-on when Q8 and Q9 are driven-off. Alternately, Q8 and Q9 are driven-on when Q7 and Q10 are driven-off. CR6, CR8, CR11 and CR12 prevent reverse currents from flowing in Q7-10 during the dead time interval (whenever the transistors are off). T1 is the base drive transformer which provides a 5 V square wave drive for Q7-10. L1, 2, 3, 4 are saturable

reactors that delay the base drive about seven microseconds. CR5, CR7, CR10 and CR16 bypass the reactors to prevent any turn-off drive delay. R24, R25, R21 and R20 limit the turn-on drive currents to a level of about 1 ampere. C4 through C7 and R26 through R29 provide terminations for L1 through L4 during the delay period. The delayed drive allows the ON pair of transistors to turn-off completely before the OFF pair is driven-on.

5.2.5.3 Converter Control. Q3-6 and their associated parts form a control circuit that controls the 29 VAC drive from T1 by controlling the AC current path for T1 primary at the center tap, T1-2. Q4 and Q5 form the normal HV on/off switch that is activated by the switch regulator PWB. When -30 VDC is applied to J2-10, Q5 turns-on allowing Q4 to turn-on and complete the AC current path for T1 primary. T1, 1-2-3 receives 29 VAC from the oscillator bias circuit. Q3 and Q6 couple in a turn-off signal from the HV converter overload shutdown circuit. When the overcurrent circuits (5.2.5.4) are activated, current is drawn through R14 which turns-on Q6. This turns-on Q3 which turns-off Q4 and opens the transformer current path. This, in turn, turns-off the drive to the converter.

5.2.5.4 Overcurrent Protection. The overcurrent protection circuits monitor the primary current of the high voltage transformer of the HV module. The circuits consist of T2, CR13, 14, 15, CR17 through CR23. A reference voltage controlled by R18 is placed on the gate of PUT CR15. Current transformer T2 provides an output voltage that is rectified, conditioned and applied to CR15. This voltage is proportional to the converter current. When this voltage exceeds the value on the gate of CR15, PUT CR15 turns-on which turns-on PUT CR14. This generates a fault command and turns-on LED indicator CR13. CR18 connects the fault signal to the logic board. CR22 is used to contact the auto reset line so that CR14, which is a

latching device, can be reset. As noted in 5.2.5.3, current through R14 will cause shutdown of the 200 volt converter. CR20 permits reset of PUT CR15.

#### 5.2.6 High Voltage Module A5

Circuit details are given in the A5 and A5A1 schematic in Section 7.

##### 5.2.6.1 General. The HV Module provides the following:

- a. TWT DC Heater Supply.
- b. TWT Collector Power Supply.
- c. TWT Helix Power Supply.
- d. Helix current metering and fault protection.

A functional block diagram of the HV module coupled to a TWT is shown in Figure 5-8. The 10 kHz inputs from the HV converter PWB are regulated buses. The helix and collector supplies share the same step-up high voltage transformer. A separate step-down transformer is incorporated into the heater supply. The HV module allows the collector voltage to be depressed below the helix voltage which extend the life and provides significant energy savings in the operation of the TWT.

5.2.6.2 Heater Supply. The circuit for the heater supply is shown in Figure 5-7. A 29 VAC square wave input on the primary of T1 is rectified and doubled by CR1, CR2 and filtered by C1, C2. Zener CR3 provides protection in the event of heater arcing.

5.2.6.3 High Voltage Transformer T2. This transformer is used for both the collector and the heater supplies. A 200 VAC regulated 10 kHz square wave is supplied to the primary from the HV converter PWB. The secondary is formed of 6 sectors connected in series. Different taps can be used for the collector and the helix circuits to depress the collector

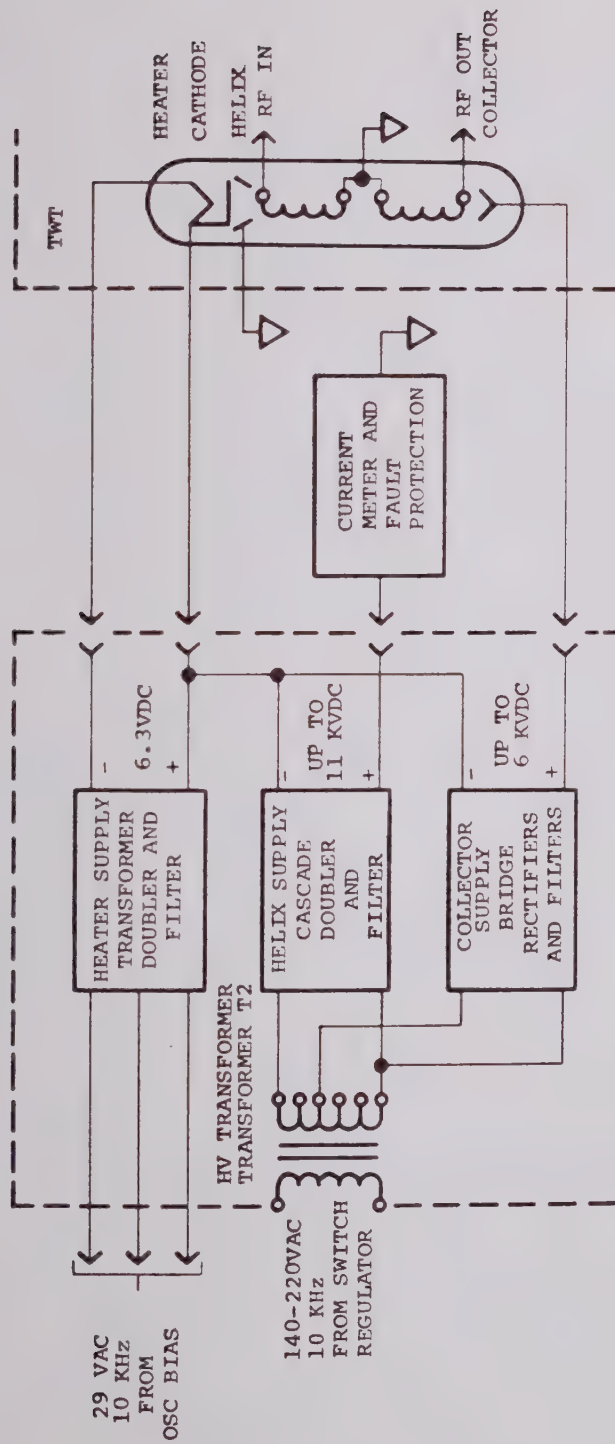


FIGURE 5-8 HV MODULE AND TWT

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properly for a particular TWT tube type. Up to 50% depression of the collector is obtainable by using the full winding for the helix. This can be reduced to zero depression by selection of the proper tap.

5.2.6.4 Collector Supply. The collector supply circuits are shown in Figure 5-9. The secondary of T2 is connected to a bridge rectifier consisting of CR4, CR5, CR6 and CR7. A spark gap (Z1) is placed across L1 to provide arc protection. R1 and R11 are current limiting resistors.

5.2.6.5 Helix Supply. The helix and collector supplies share a number of components. A simplified schematic is shown in Figure 5-9. The circuit for the helix supply is a modified form of a cascade doubler. During the negative portion of the AC input cycle when the top of the transformer is negative (Figure 5-9A) diode CR8 is forward biased and C3 charges to peak voltage  $V_h$ . During the next half cycle (Figure 5-9B) CR8 is reverse biased and acts like an open circuit. The voltage  $V_c$  on the output of the transformer and the charge ( $V_h$ ) of C3 are additive so that C1 and C4 are charged to  $V_c + V_h$  through diode CR6 and CR9. Note that the helix to cathode voltage is  $V_c + V_h$  and that the charge on capacitor C4 is  $V_h$ . Resistor R7 is a bleeder for C2, C5 and C3, C6. L1, C2, C3, C5, C6 in conjunction with C1 and C4 form a Pi filter to remove the 10 kHz, 20 kHz, and higher frequency ripple components.

5.2.6.6 Helix Current/Voltage Sense and Fault Protection. These circuits, Figure 5-10, are designed to allow metering and fault detection to occur at low potentials with respect to chassis ground to avoid danger to personnel or equipment. The diode pair CR4, CR5 clamp M1 to 700 mV max. In the event of a short circuit or arc of the high voltage to ground. The voltage between the junction of R9/R10 and ground is

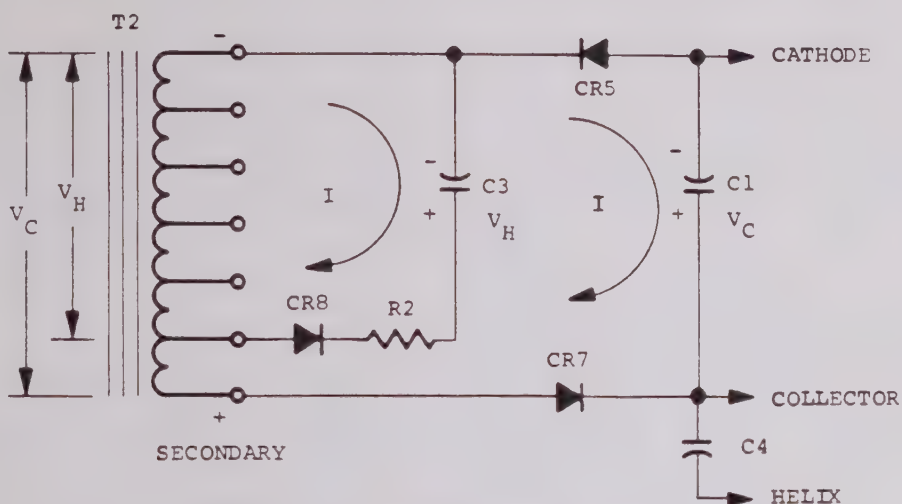


FIGURE 5-9A NEGATIVE HALF CYCLE

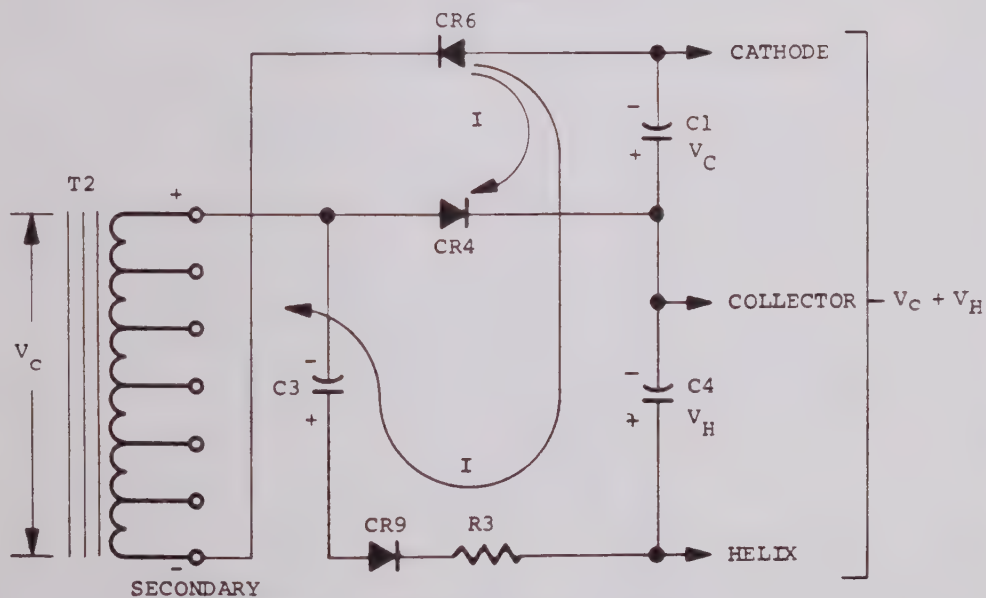


FIGURE 5-9B POSITIVE HALF CYCLE

C1 CHARGES TO  $V_C$  THROUGH CR5 AND CR7 OR CR4 AND CR6

C3 CHARGES TO  $V_H$  THROUGH CR8 AND R2

C4 CHARGES TO  $V_H$  THROUGH CR6, C1, CR9 AND R3

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FIGURE 5-9 HELIX AND COLLECTOR RECTIFIER CIRCUIT OPERATION

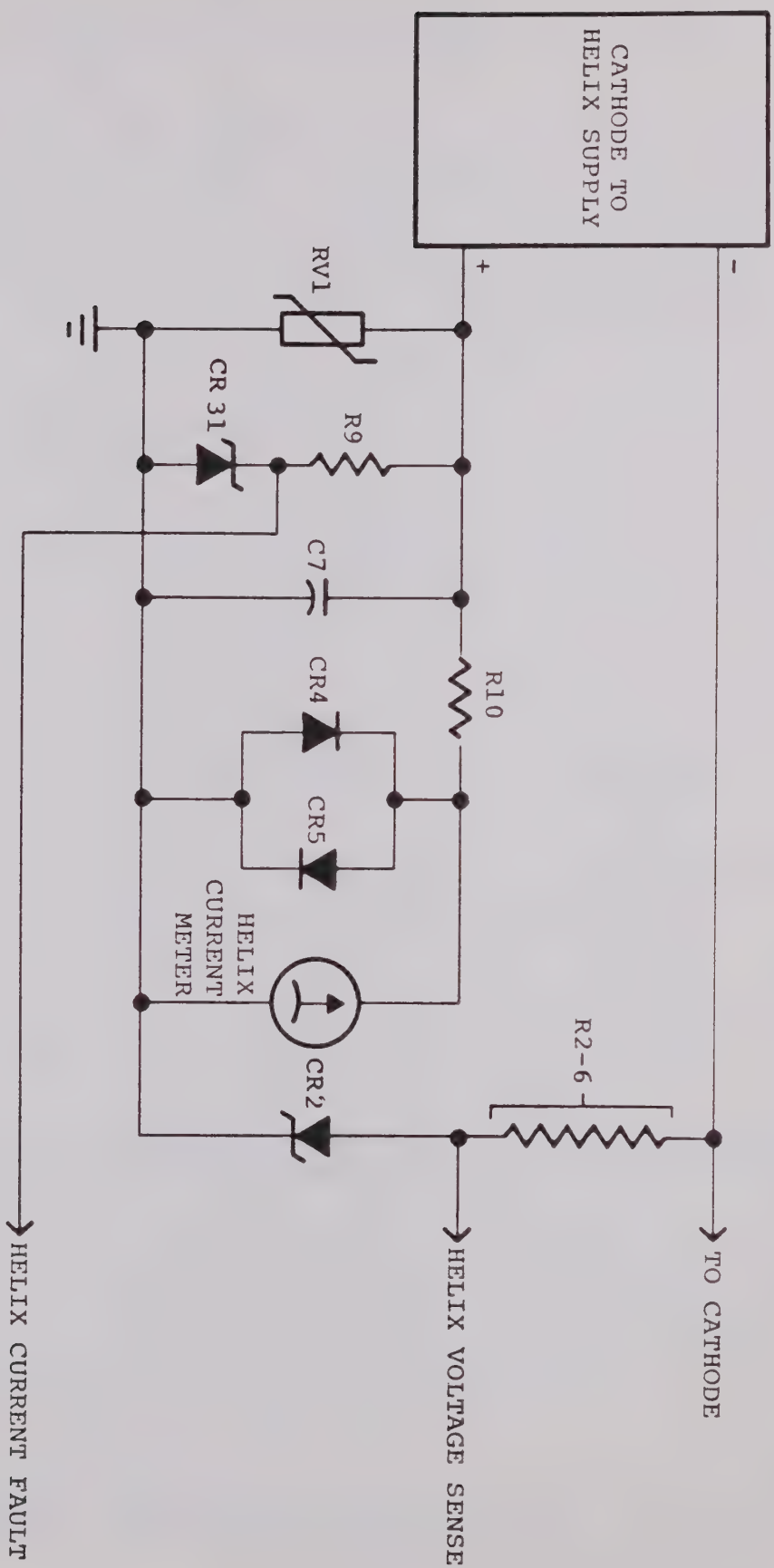


FIGURE 5-10 HELIX CURRENT VOLTAGE SENSE AND FAULT PROTECTION

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proportional to helix current and this is fed via feed-through connections on several boards to the detection circuit on the logic board A3 (1A3U7-2).

R2 through R6 along with CR2 form the bleeder circuit for both helix and collector supplies. In addition, they form a helix voltage sense string at J4-6 which is fed to the input of switch regulator feed back amplifier 1A3A3 to regulate the helix voltage.

Terminals are provided to short out R3, R4, R5 or R6 if needed for a coarse helix voltage adjustment. See Section 6, Table 6-5 for the connections required for your TWT. See Section 5.2.4 for further discussion of helix regulation by the switch regulator.

Zener CR2 will conduct at voltages in excess of 200 volts and prevents the helix voltage sense line from floating at cathode potential when the sense line is unterminated. RV1 limits helix current sense resistor voltage to 200 V during arcs. C7 attenuates spikes and noise on the helix sense circuit. CR3 and R9 limit the output voltage of the helix sense circuit at J4-8 to 100 V during arcs. CR1 connects the collector supply to the bleeder string (R2-R6 through CR2) when power is removed.

#### 5.2.7 Logic PWB

5.2.7.1 General. The logic circuits provide the control, monitoring and protection of the PA. A functional block diagram of the Logic PWB is shown in Figure 5-11.

#### NOTE

Incorporation of the Fault/Recycle PWB option is required for operation in the AUTO RESET mode. Check Section 1, Table 1-1 to determine if your PA includes this option.

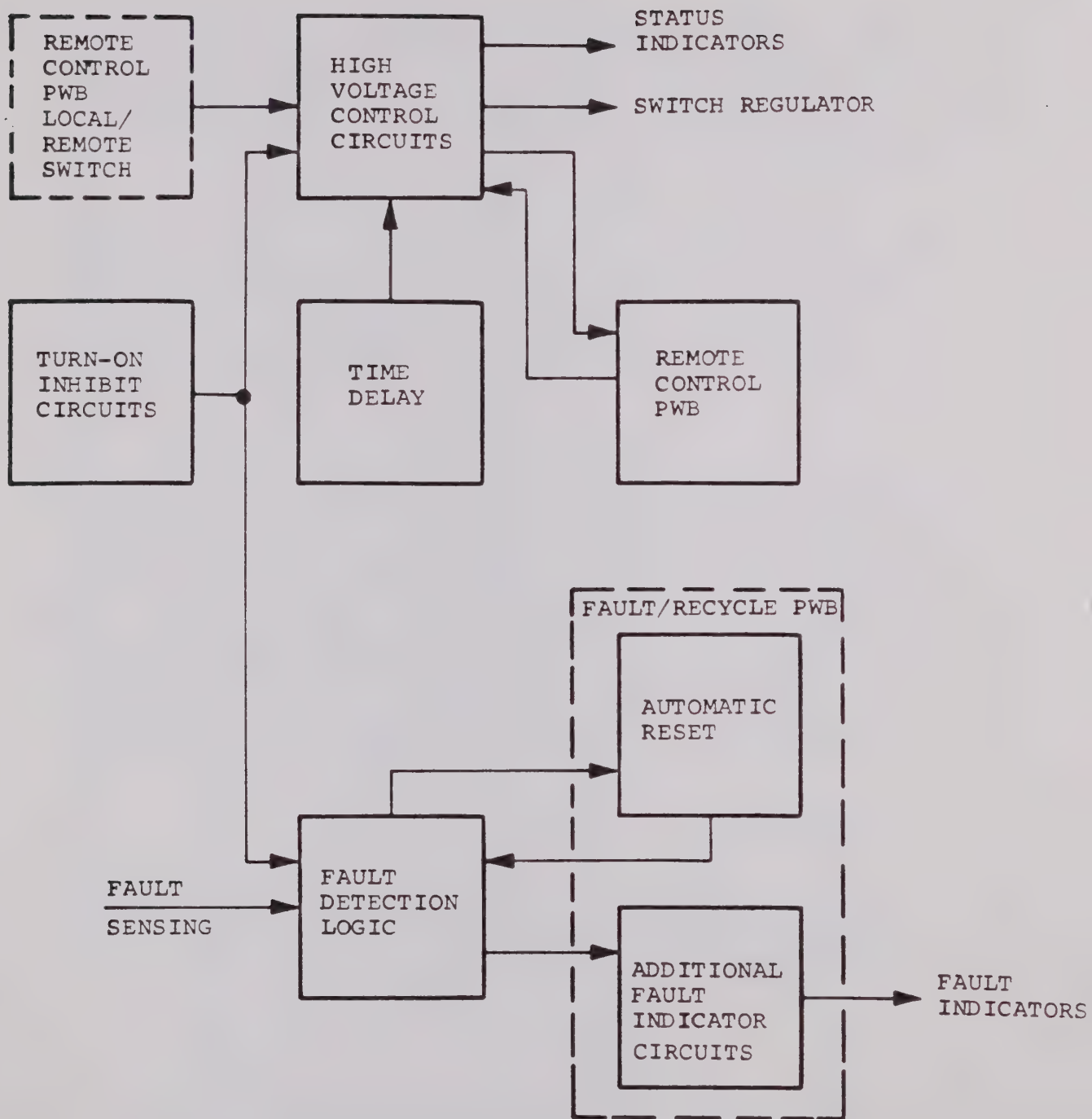


FIGURE 5-11 LOGIC PWB FUNCTIONS



5.2.7.2 High Voltage Control. The High Voltage Control circuits are shown in Figure 5-12.

NOTE

Figure 5-12 includes the circuits for the Remote Control Option. See Section 1, Table 1-1, to determine if your PA includes this option.

The output of U9A must be a logic low (0) to turn-on the high voltage power supply. U9A drives Q4 through U2A which enables 1A3U2 on Switch Regulator PWB A3 and allows the Schmitt trigger to operate. U9A also drives Q8 through U2D which provides an enable signal for the -200 VDC undervoltage protection circuit on oscillator bias PWB A2.

Without the Remote Control option installed, U10A-3 is connected (Jumper 4) to common and U10A13 always remains high. U12C bilateral switch "contacts" pins 8 and 9 are closed by a "1" state at U12C-6. Pins 1 and 2 are opened by a "0" state at U12C-13. This means that high voltage can only be turned-on by a "0" at U10C-15 causing U10C-1 to switch to a "1" which drives U9A-2 high through U12C.

With the Remote Control board installed, when the "local" position of the local/remote switch is selected, operation is the same as described above. In the "remote" position, U10A-13 will be "0", U6C-6 will be "1". This closes contact pins 1 and 2 of "switch" U12C and opens contact pins 8 and 9. High voltage can only be turned-on by a "0" at U10B-7 causing U10B-9 to switch to a "1" which drives U9A-2 high through switch U12A.

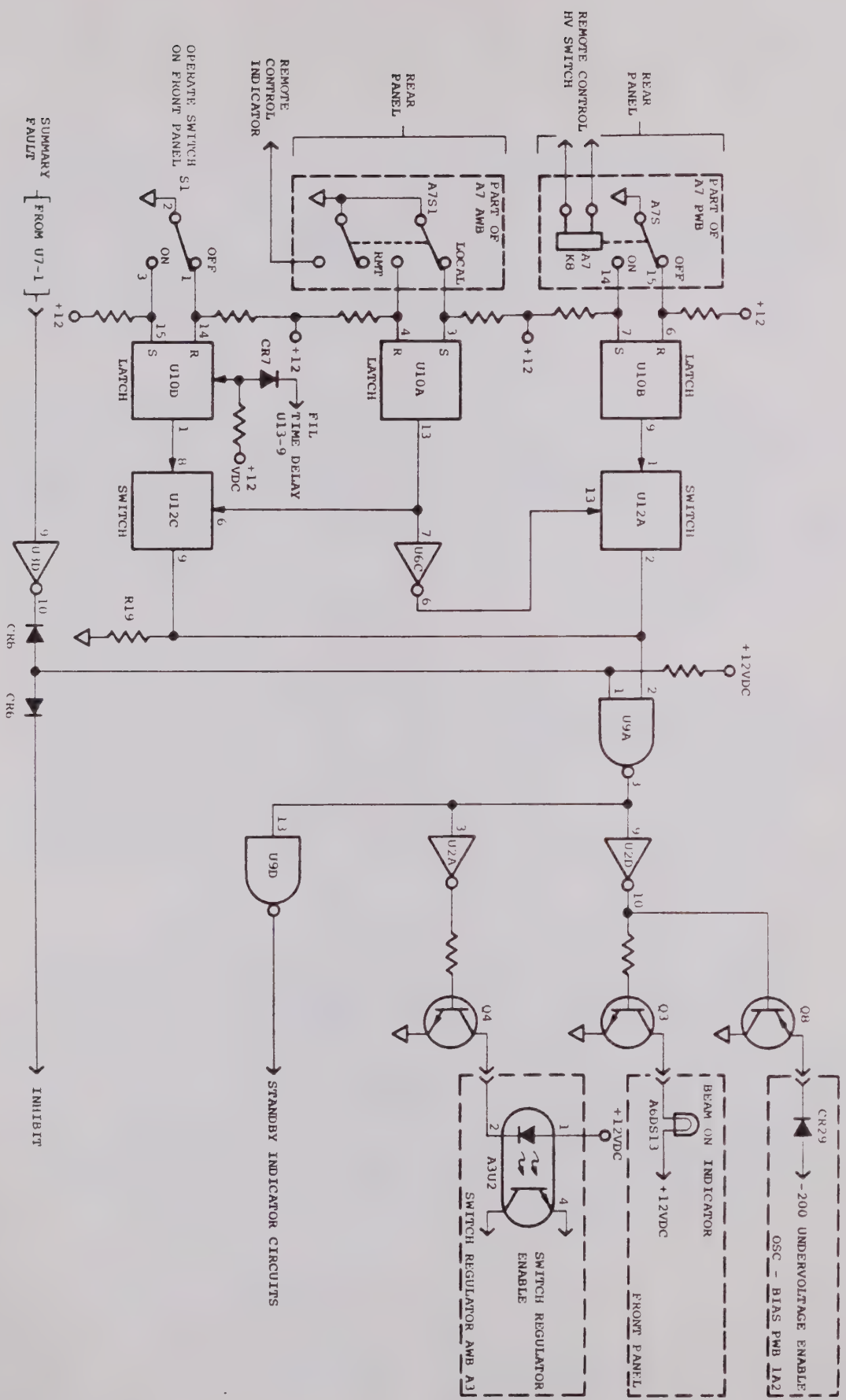


FIGURE 5-12 SIMPLIFIED SCHEMATIC-HIGH VOLTAGE CONTROL

NOTE: NOT ALL CIRCUIT COMPONENTS SHOWN. SEE ALL SCHEMATIC FOR DETAILS.

Actuation of relay 1A7K8 of Remote Control PWB A7 by closing a remote switch to ground pulls U10B-7 to a logic low (0) state. When U9A-2 is in the "1" state, HV ON has been selected. If there is no fault, U9A-1 will be "1" and HV will be turned-on to the TWT and "BEAM ON" will light on the Front Panel and give a remote status indication. The logic state associated with high voltage control for different input conditions is shown in Figure 5-13.

**5.2.7.3 Filament Time Delay.** This circuit inhibits High Voltage turn-on until the TWT filament reaches the proper temperature (approximately three minutes delay) and provides immunity against unnecessary time delay recycling during transient prime power interrupts (order of a few seconds).

A simplified schematic of the circuit is shown in Figure 5-14. Schematic details are given in the A1 schematic in Section 7.

The focal point for operation of this circuit is the voltage charge on capacitor C28. U13 includes a circuit (A) that prevents C28 from charging until U13 is triggered on by a positive going voltage applied to pin 2. Pin 2 is tied to +12 VDC so that, when PA power is turned-on, the FTD circuit is triggered on. When U13 is triggered on and 12 VDC is applied to R57, C28 charges at a rate set by R57, R58, C28. The values are chosen so that the voltage on C28 is approximately 1.18 volts in three minutes. U13 includes an internal voltage reference (B) that applies 1.18 VDC to one side of an internal comparator (C). When C28 is charged to 1.18 volts, the output transistor (D) is turned-off and pin 9 changes from a logic low state to a logic high.

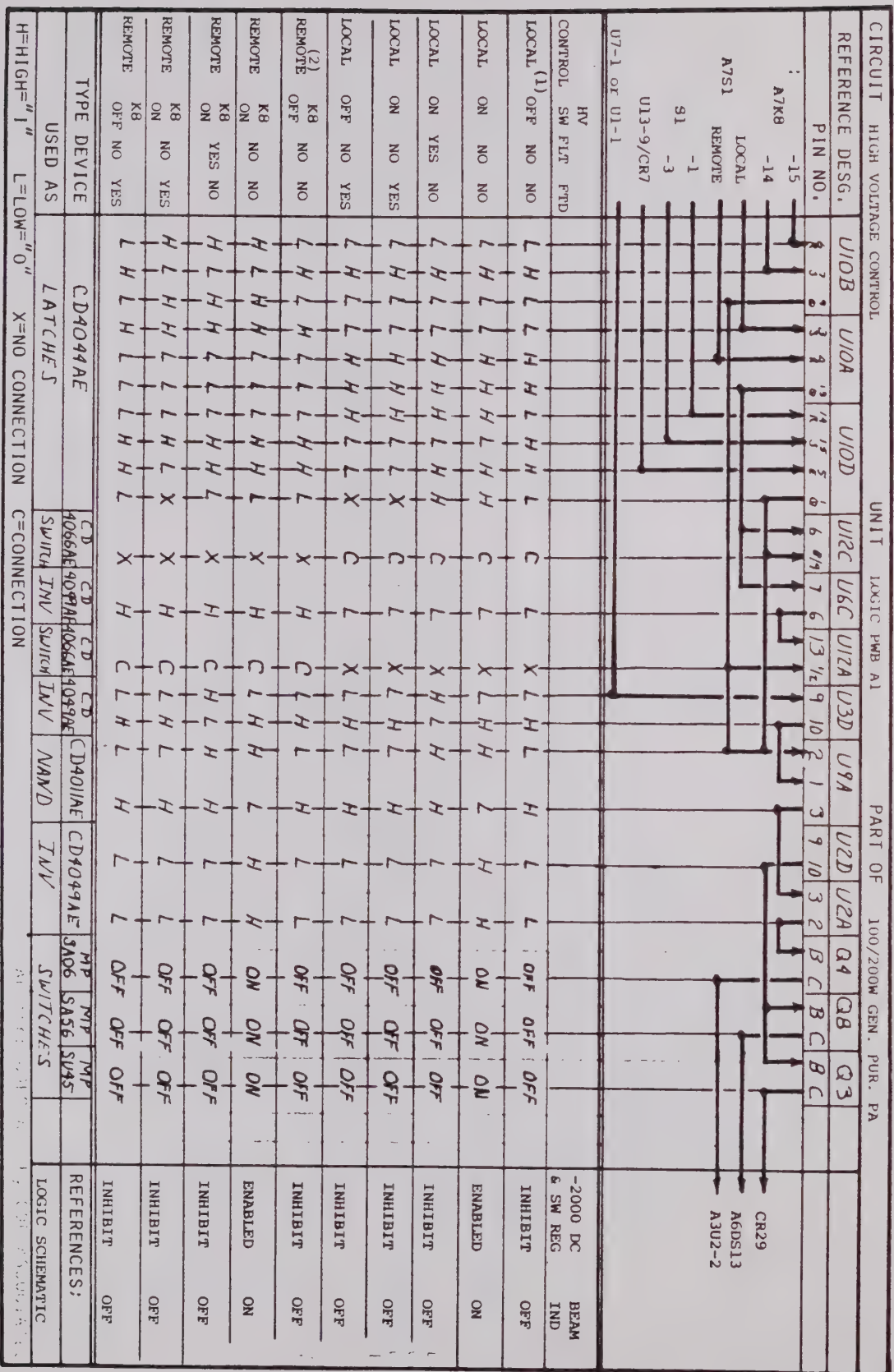


FIGURE 5-13 HIGH VOLTAGE CONTROL-COMPOSITE PRESENTATION OF SIGNAL PATHS AND LOGIC STATES

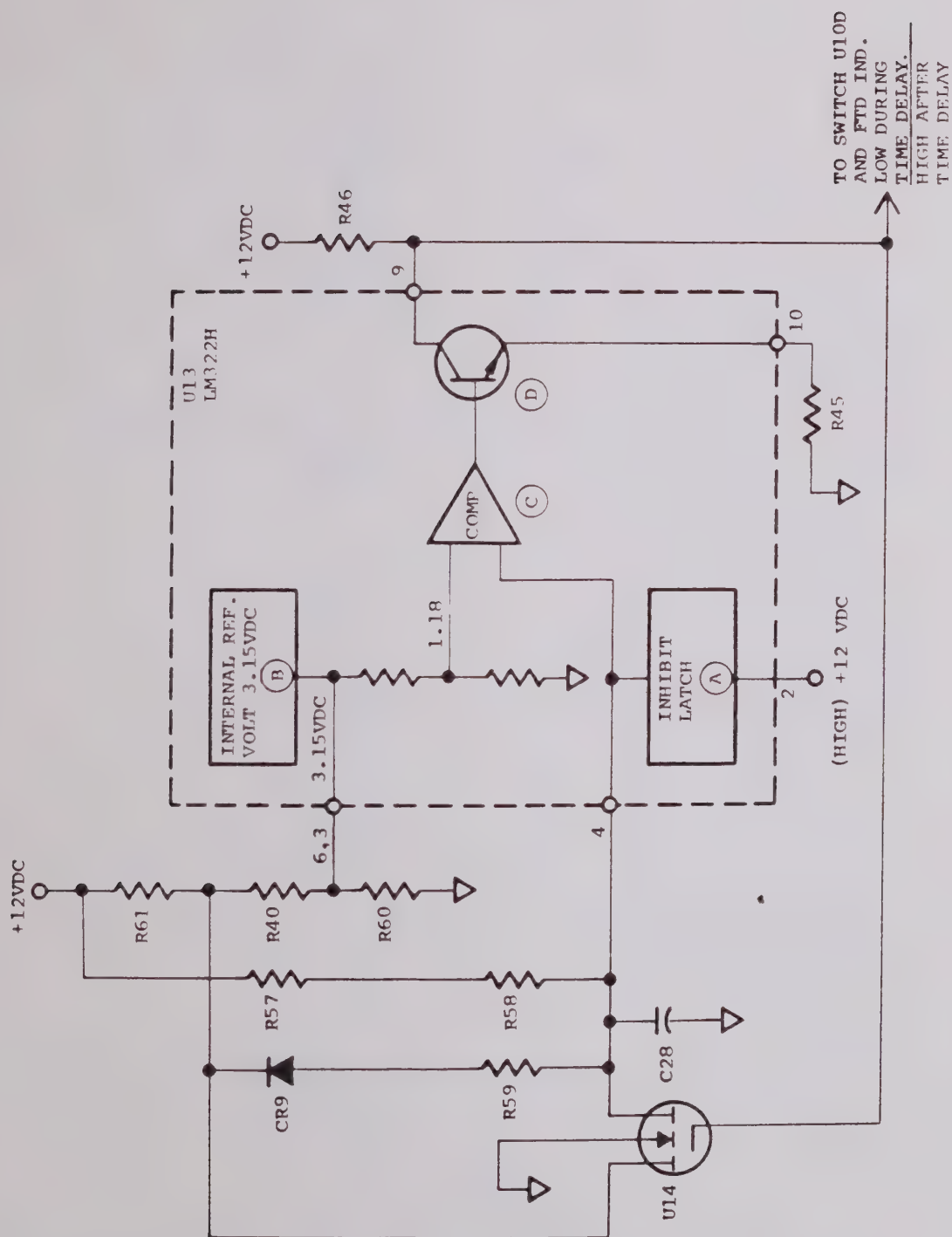


FIGURE 5-14 SIMPLIFIED SCHEMATIC DIAGRAM-FILAMENT TIME DELAY

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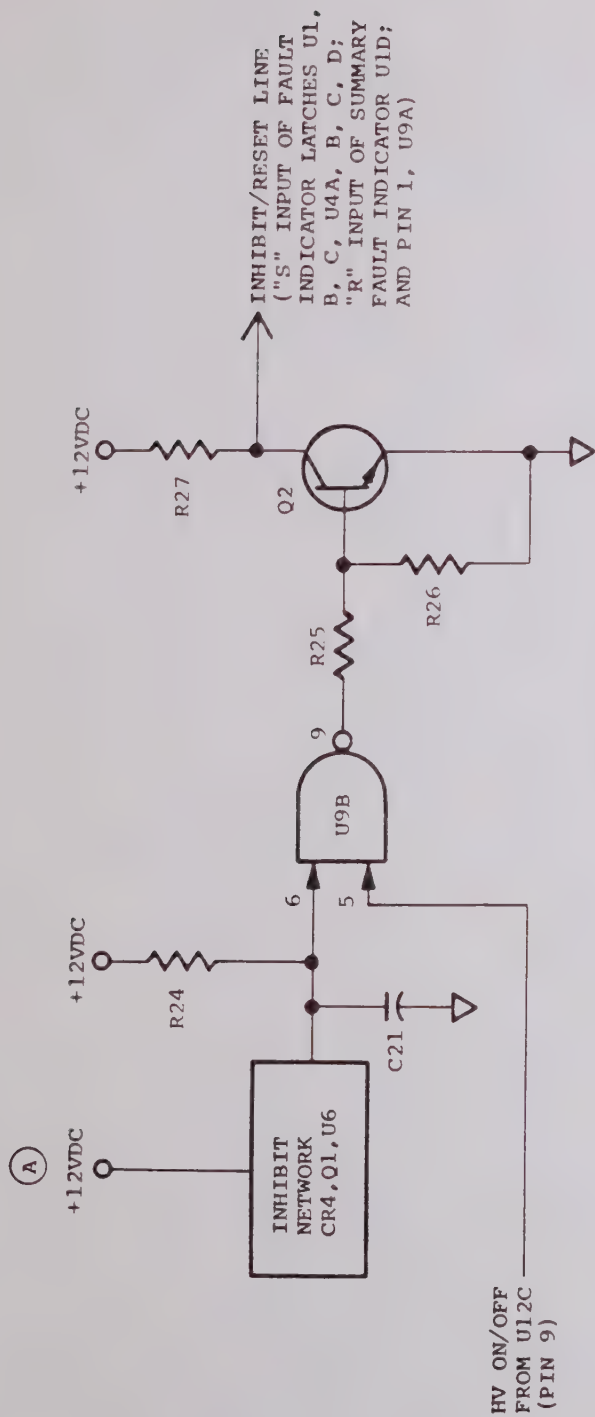
When the +12 VDC supply voltage is interrupted C28 can discharge through R59, CR9, R40 and R60. U14 acts like a switch across R59, CR9. When the 12 volts supply is first interrupted, there is sufficient residual charge to hold U14 on so that C28 would discharge with a time constant of about 1.2 seconds. As the 12 volt supply continues to discharge, U14 turns-off and the time constant for discharge of C28 increases to approximately ten seconds. The purpose of the immunity circuit is to hold the charge on C28 high enough that for very short interruptions (1-2 seconds) there will be no delays for filament heating and for longer periods the time delay will be approximately proportional to the length of time the power is off. The filament time delay circuit will recycle completely if power is interrupted for longer than 90 seconds and there will be no recycling action for interruptions of 2 seconds or less.

#### NOTE

This PA is equipped with fast response fault detection circuits. If you "flip" the OPERATE/OFF/RESET switch from OPERATE to OFF/RESET and back again you may induce faults. When you turn the BEAM OFF, wait one second before returning to OPERATE again. If there is a fault indication after a very short prime power interruption, this is normal and the Fault Recycle and Indicator PWB A8 will automatically clear such faults.

5.2.7.4 Inhibit/Reset Circuits. A functional diagram of the Inhibit/Reset Circuits is shown in Figure 5-15. The functions of these circuits are:

- a. Inhibit of summary fault and HV ON until +12 VDC logic supply voltage reaches a value in excess of 9.8 volts.



TRUTH TABLE

| DEVICE REF DESG                          | U9   |      | Q2   |           | RESULT             |
|------------------------------------------|------|------|------|-----------|--------------------|
|                                          | 6    | 5    | BASE | COLLECTOR |                    |
| INITIAL TURN-ON<br>A LESS THAN 9.8 VOLTS | LOW  | LOW  | HIGH | LOW       | INHIBIT &<br>RESET |
| A GREATER THAN 9.8 V<br>HV OFF           | HIGH | LOW  | HIGH | LOW       | INHIBIT<br>REMOVED |
| A 9.8 VDC<br>HV ON                       | HIGH | HIGH | LOW  | HIGH      | INHIBIT &<br>RESET |

FIGURE 5-15 FUNCTIONAL DIAGRAM-FAULT INHIBIT/RESET

- b. Inhibit operation of summary fault indicator in HV "OFF" mode.
- c. Reset fault indicators when HV "OFF" conduction is selected.

The circuits consist of an inhibit network that operates during initial logic power turn-on and a NAND logic circuit that drives the affected devices. The inhibit network holds C21 low until the +12 VDC bus voltage exceeds 9.8 VDC. Referring to the A1 logic schematic in Section 7, transistor Q1 is off at initial turn-on and the input to inverter U6E (pin 11) is high. This pulls C21 low through R23 and CR5. When the +12 VDC bus voltage reaches about 9.8 VDC, zener CR4 will conduct which turns Q1 on. This drives U6E12 high and allows C21 to charge up to +12 VDC in approximately 0.1 second. When C21 is fully charged and U12C-9 is high (HV ON command), NAND gate U9B-9 will go low which turns-off Q2 driving the collector of Q2 high. The truth table in Figure 5-15 shows the operation of the logic circuit. Note that an HV OFF command will produce the same inhibit/reset conditions as exist at initial turn-on even though C21 is fully charged.

5.2.7.5 Fault Detection Logic and Indicators. The Fault Detection Logic and Indicators are part of the overall safety and protection features built into the Power Amplifier. A functional diagram of the Fault Detection Logic and Indicators is shown in Figure 5-16.

The function of the Fault Detection Circuits is to turn high voltage off when a fault occurs and to indicate the area where the fault occurred. Schematic details are contained in the drawings referenced in Figure 5-16 which are included in Section 7 of this manual. As shown in Figure 5-16, the output of the fault sensing circuits branches along two parallel logic paths. The upper path involving U6F, U1D, U9A controls operation of the High Voltage Beam Supply, the automatic fault recycle circuits and some of the operational indicators. The lower path involving latches U1 and U4 and the fault/recycle PWB indicates the function that initiated

| S | R | Q      |
|---|---|--------|
| 0 | 0 | 0      |
| 0 | 1 | 1      |
| 1 | 0 | 0      |
| 1 | 1 | NC (X) |



REFERENCE: A1 (LOGIC) SCHEMATIC, UDI (OVERALL) SCHEMATIC

FIGURE 5-16 FUNCTIONAL BLOCK DIAGRAM-FAULT DETECTION LOGIC AND INDICATION

the fault signal. The logic state for a fault that occurs when HV is ON and there is no inhibit/reset output is given in Figure 5-16. A more comprehensive set of signal paths and logic states are shown in Figure 5-17. In Figure 5-17, example faults were applied to pin 3 of U5. Since U5 is a NOR, a fault on any one of the fault inputs to U5 (3, 4, 11, 12, 13, 14) will produce the same result. Note that any time there is a High Voltage OFF command from the central panel switch, Q2 of the inhibit/reset circuit (Section 3.3.4) will be on and the output of U1D (pin 1) will be low. This will prevent the summary fault indicator A6DS12 from being turned-on. During the Filament Time Delay period the same condition will exist.

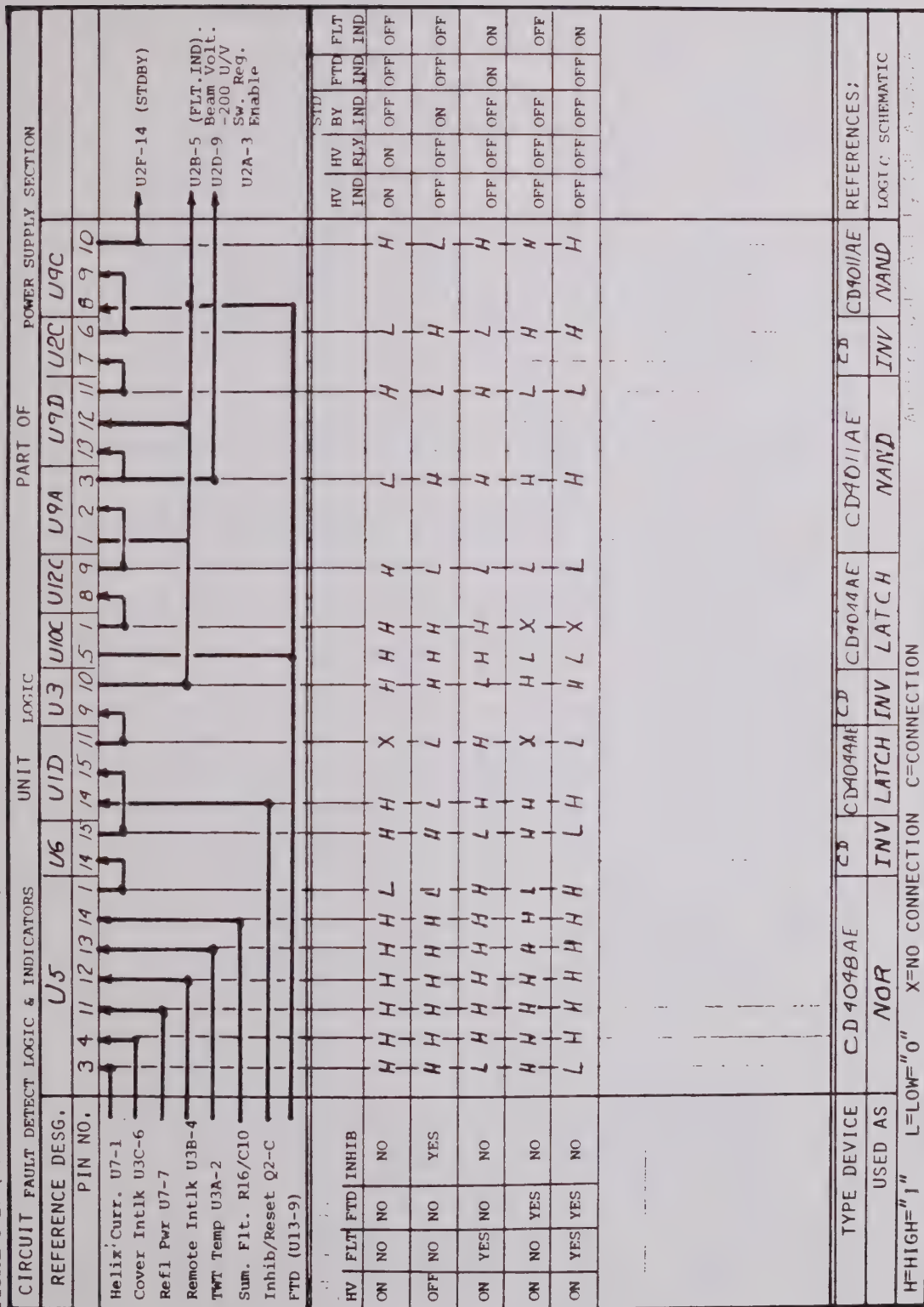
See Section 5.2 for a description of the Fault/Recycle PWB option. The operations of the various fault logic circuitry are as follows:

- a. Helix Current Fault - Helix current is sensed by the voltage developed across a resistor in the HV module. The input voltage is approximately 0.1 VDC/mA. If the current drawn by the helix is excessive, the voltage at amplifier U7A-2 (LM358N) will be higher than the reference voltage at U7A-3 (adjustable by R3). If this happens, U7A-1 will switch to "0" signaling a fault. During turn-on of HV, the helix will always draw more current due to beam defocusing. For this reason, R1 and C29 provide a short immunity time delay before an actual fault is signaled.



FIGURE 5-17 (WITHOUT FAULT RECYCLE OPTION)

COMPOSITE PRESENTATION OF SIGNAL PATHS AND LOGIC STATES



- d. Reflected Power Fault (VSWR) - If a reflected power shutdown option has been included, the RF reflected power will be monitored by a diode detector. Input voltage is in the range of +50 to +150 mVDC. If the U7B-6 (diode voltage output) is higher than the reference voltage at U7B-5 (adjustable by R6), then U7B-7 will switch to "0" signaling a fault. R4 and C30 provide a short immunity time before an actual fault is signaled.
  
- c. Interlock Faults - If the top or bottom cover is removed, interlock switch contacts on the top or bottom of the chassis will open. This will put a logic "1" on U3C-7, U3C-6 will switch to "0" and a fault is signaled.
  
- d. Remote Interlock - If there is no Remote Control option installed, jumper 5 will keep U3-5 low, and no remote interlock fault can be signaled. If a Remote Control option is installed, U3B-5 will be connected to common via the Remote Control unit if a remote fault is signaled.
  
- e. Temperature Switch - If the TWT temperature exceeds approximately 230<sup>0</sup>F (110<sup>0</sup>C) at the TWT neatsink, the thermal switch will open putting a logic "1" on U3A-3, U3A-2 will switch to "0" and a fault is signaled.

- f. Power Supply Fault - J4 pin 4 is a summary power supply fault signal. Normally this voltage will be "1". If any fault from the converter, switch regulator or oscillator bias card is present, the voltage at R16 will change to "0" and a fault is signaled.

All faults are connected to U5; when any input to U5 goes to "0", U5-1 switches to "1", U6F-15 switches to "0" and U1D-15 has a "0" applied. This "0" causes an immediate HV shutdown, and a "fault" indication will light on the Front Panel. When the HV switch is switched OFF, gate U11 will provide a short pulse to Q9, resetting any power supply summary fault.

The logic for the specific fault indicators such as External Interlock is straightforward. A fault on any of the input lines drives the input to NOR U5 low, at the same time the R input to the indicator latches is driven low. Note that while the same type of latch is used for the summary fault circuit, the inputs are the reverse of those used for the specific fault indicators. Referring to the latch truth table in Figure 5-16, when the R input is low and S high, the latch output will be low. This output is inverted and turns-on the transistors (A2A2Q1 through Q6) for the proper channel. If the fault persists, the output would remain low and the indicator stay lit even though the inhibit/reset circuit pulls the S input low. If the fault is removed, pulling the S input low would reset the latch and turn off the specific fault light.

5.2.7.6 TWTA Status Indicator Logic Circuits. These circuits and the interfaces of these circuits with the control and fault logic are shown in Figure 5-16. These circuits drive the Status Indication Display Module A6 which is mounted in the Front Panel and the appropriate relays on the Remote Control Panel PWB A7.

A low on the input to any one of inverters U2A, B, D, E and F causes the coupled U2 output to go high which turns-on Q3, 4, 5, 6 and 7 as appropriate. During the time-out period, U9C-8 is held low which drives U2F-14 high. Therefore, either the TIME DELAY or STANDBY indicators are illuminated. After time out, a high voltage ON command will drive U9A-3 low causing U9D-11 to go high and U2C-6 to go low which drives U9C-10 high. This will extinguish the STANDBY indication by turning Q6 OFF. A fault will drive U3D-10 low and turn-on Q7 which will illuminate the FAULT indicator and inhibit the STANDBY indicator through U9D to U2C to U9C to U2F to Q6.

#### 5.2.8 Fault/Recycle A8

5.2.8.1 General. The Fault/Recycle PWB provides functions that enhance both operation and troubleshooting of the PA. The unit will activate additional fault indicators as follows:

- |    |                              |               |
|----|------------------------------|---------------|
| a. | Helix Current Fault          | (HELIX CURR)  |
| b. | Reflected Power (VSWR) Fault | (REFL RF)     |
| c. | Cover Interlock Fault        | (COVER INTLK) |
| d. | Remote Interlock Fault       | (EXT INTLK)   |
| e. | TWT Overtemperature Fault    | (OVER-TEMP)   |
| f. | Power Supply Fault           | (POWER SPLY)  |

Any fault turns the "STANDBY" light on; the type of fault will be displayed, and three attempts will be made to restore operation. If, after the third attempt normal operation is not restored, then the "FAULT" light will go on and "STANDBY" will go out. If the fault was of a temporary nature, such as "REFL RF" and the fault is removed, the "BEAM ON" will light. However, the "REFL RF" indication light will remain until reset with the OPERATE/OFF/RESET switch.



5.2.8.2 Fault Indication Drive Circuits. These circuits are shown in Figure 5-16 and the A1 schematic. The fault detection logic drives one of the inputs to 1A1U5 (U5-3,4,11,12,13,14) in parallel with one of the inputs to 1A1U4 and U1 (U1-6,12, U4-4,6,12,14). 1A1U4 and 1A1U1 operate in accordance with the Truth Table presented below:

TRUTH TABLE FOR A1U4/U1

(CD4044AE) (Pin 5 High)

| <u>S</u> | <u>R</u> | <u>Q</u>  |          |
|----------|----------|-----------|----------|
| 0        | 0        | 0         | 0 = low  |
| 0        | 1        | 1         | 1 = high |
| 1        | 0        | 0         |          |
| 1        | 1        | No Cnange |          |

At initial turn-on the "S" input to latches U1B, C and U4A, B, C, D, are driven low by the Innibit/Reset Circuit and the "R" input (with no faults) are high. This sets the Q output of these latches high and the specific fault indicators will be off. After initial turn-on, the "S" input is allowed to go high and the output of the latches remain high. When a fault occurs, this drives the "R" input to the specific fault indicator latches low which then turns-on the indicator transistor (Q1 through Q6) via the appropriate U1 inverter. Each time the OPERATE/OFF/RESET switch is placed in the OFF/RESET position, the indicator latch will be reset if there is no fault. If there is a fault on one of the inputs, the indicator will stay on until the fault has been cleared.

5.2.8.3 Automatic Fault Recycling Circuits. The fault recycle circuits are designed to count the number of faults that occur in a 20 second interval. If four faults occur during the 20 second interval, high voltage operation will be inhibited and operator action required to clear the fault. If the circuit detects three or less faults during the 20 second interval, the



circuits will automatically recycle and reset the fault detection circuits.

A functional block diagram for the automatic fault recycle circuits is shown in Figure 5-18. The circuit works the same for a continuous fault or for a discrete fault that occurs at different points in time. When a fault occurs, the output of U6F-15 is driven low from its normally "high" state. This trips two latches (A8U4A, A8U4D) in addition to A1U1D. The sequence of recycling events is shown in Figure 5-19.

The time relationship for the operation of the recycling sequence is also shown in Figure 5-19. There are two timers incorporated into the circuit, 20 second interval timer (U5) and a 1.2 second recycle timer (U12A). A fault counter, U2B, is also incorporated in conjunction with a reset inhibit circuit. A single discrete fault indication on U6F-15 will initiate operation of both timers and increment the fault counter. Both timers are driven by a 7 Hz clock, U6B. U5 will reset the fault counter after 20 seconds if less than four faults occur during the 20 second interval. At the same time U4D will also be reset. If four faults occur, the reset inhibit circuit (which consists of U3B, U4B, U3D), will inhibit reset of U2B through NAND U7C by placing a low on pin 9 of U7C which forces the output of U7C high. The output of U7C is connected to the reset input of U2B (pin 15) via inverters U3A. As long as latch U4D of the reset inhibit circuit signals four faults, operation of the high voltage supply will be inhibited because U3D is connected to U7D which connects to the high voltage control circuits through A1U3D and A1U9A.

The fault counter is incremented by the output of latch U4A. The same output resets recycle timer (U2A). The recycle timer will generate a reset signal for this system approximately 1.2 seconds after the output of latch U4A goes high and initiates operation of U2A through U2A-2 and inverter U3C. The system reset pulse is generated when U2A-6 goes high. This signal is

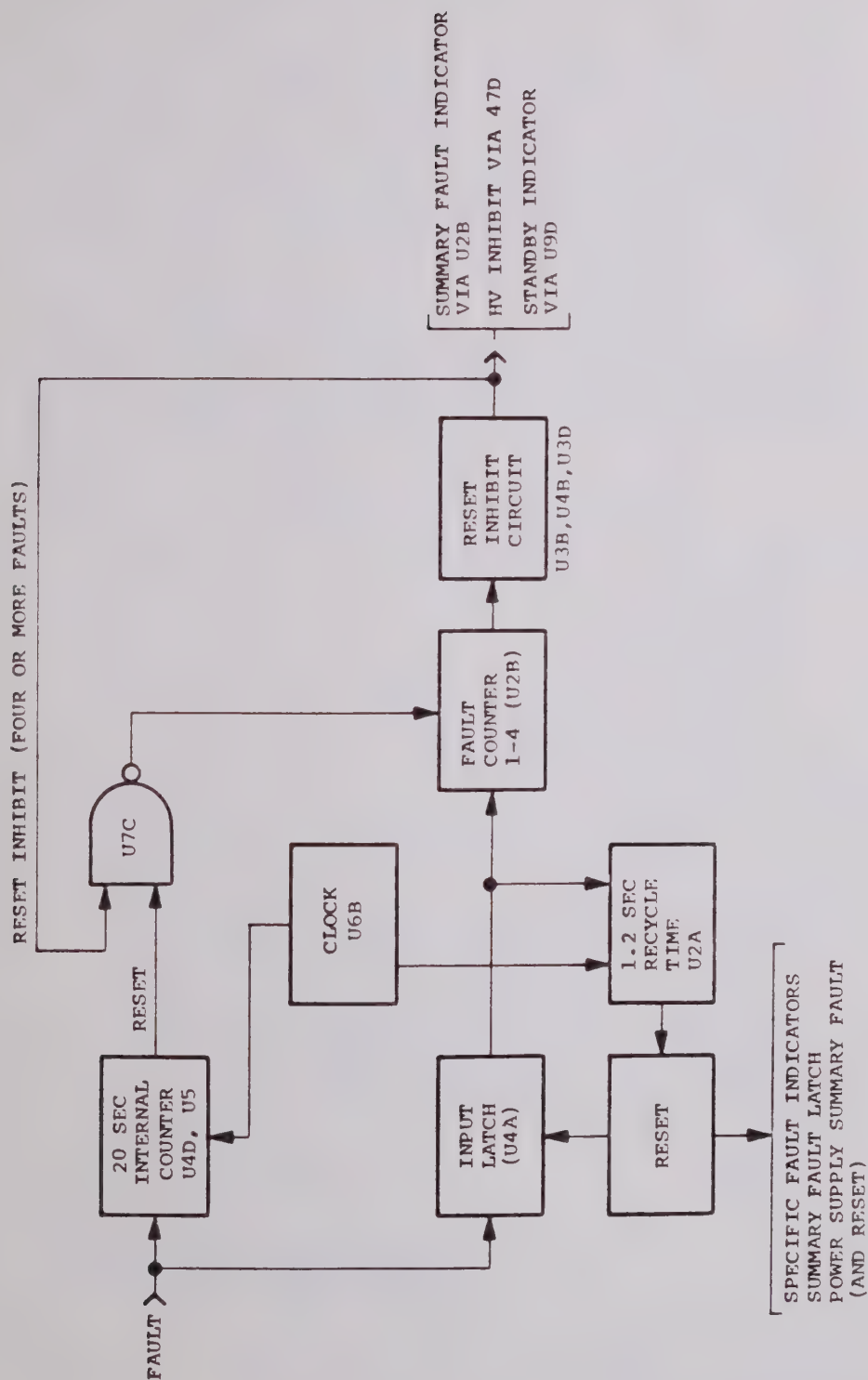
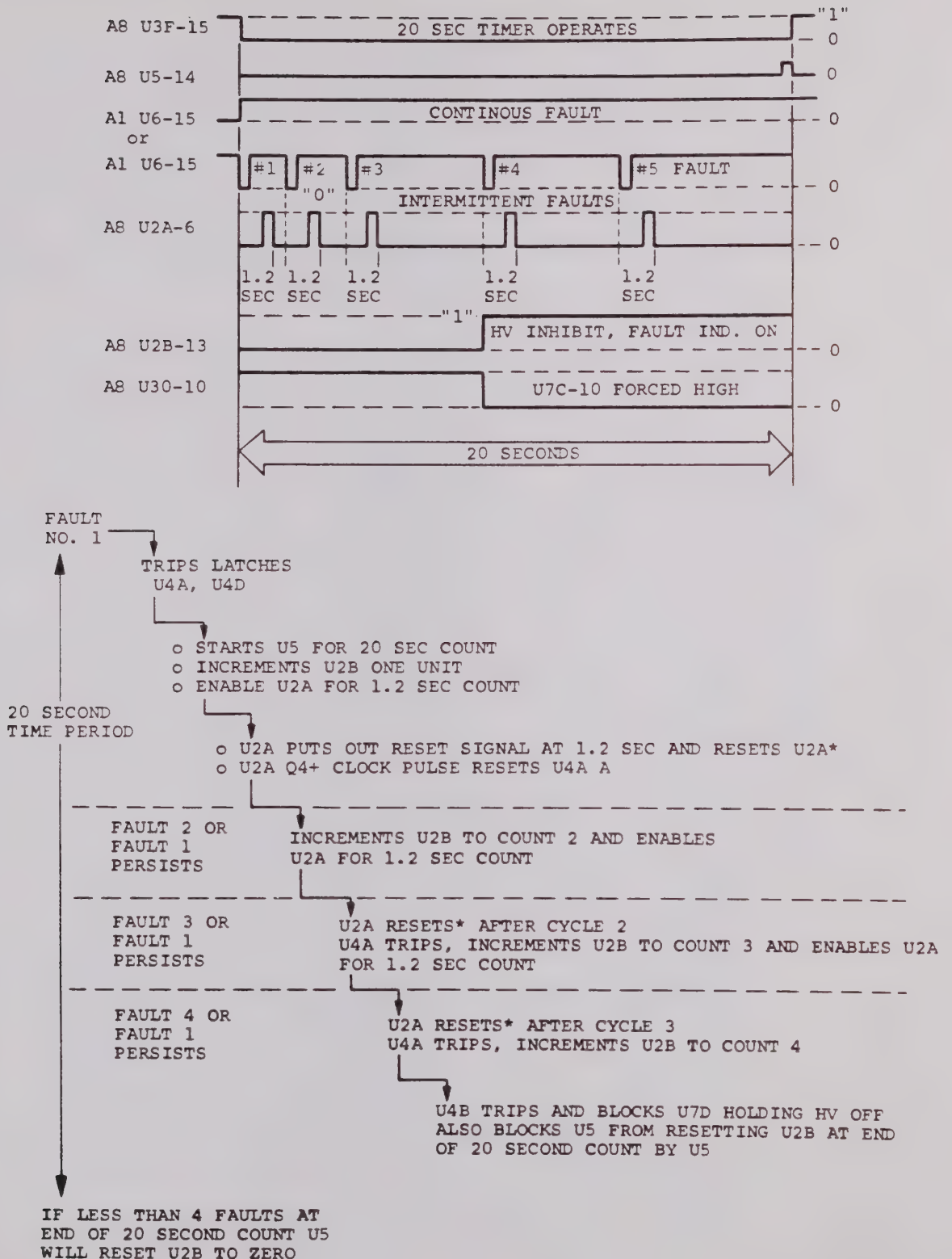


FIGURE 5-18 FUNCTIONAL BLOCK DIAGRAM-AUTOMATIC FAULT RECYCLING CIRCUITS

0918-8/84

# TIMING



0919-8/84

FIGURE 5-19 AUTOMATIC FAULT RECYCLING CIRCUITS-SEQUENCE OF EVENTS AND TIMING RELATIONSHIPS

inverted by U7B pulling the system reset line low through diode CR1. The output on U2A-6 also connects to NAND U7A. Coincidence of a clock pulse from U6B and a high on U2A-6 resets latch U4A and the circuit is ready for actuation by another fault. Multiple faults that occur within the 1.2 second recycling period will not cause any action. A persistent fault that is present when the recycle timer drives U2A-6 high will immediately increment the fault counter one count and force a repeat of the recycle operation. As long as a fault is signaled on U4A-3 the recycle timer will continue to cycle and try to reset the system. On the fourth fault, the circuit latches into a high voltage inhibit interval timer innibit mode. Similarly, the 20 second interval timer will continue to cycle as long as there is a fault on the input to U4D.

The logic states of the various components at different points in the sequence are presented in Figure 5-20.

#### 5.2.9 Status Indicator Display A6

The format of the A6 unit is shown in Figure 5-21. A common 15 VDC bus is connected to terminal 10 (behind the Varian logo). Each indicator terminal is wired to an indicator driver, on either the logic or fault recycle PWB, that completes the path to the 15 VDC return and lights the applicable portion of the display (see Section 5.2.7.6). The indicators are long-life (#1815 or equivalent) incandescent bulbs which are are replaceable from the front panel (See Table 6-2). To gain access to the lamps, press the center of the left and right edges simultaneously and remove the lamp insert assembly.

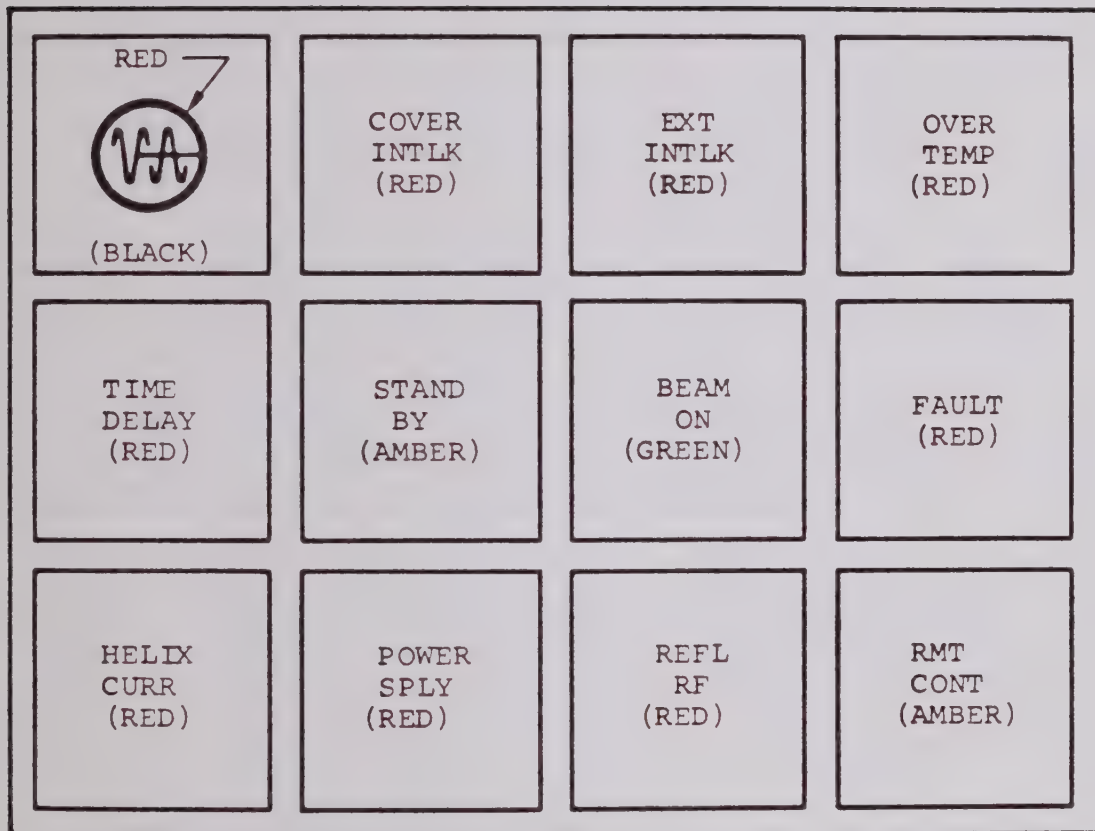
#### 5.2.10 Remote Control PWB A7 (Option G)

The Remote Control option provides a means for either local or remote control of the high voltage, remote interlock, remote status indication for filament time delay (FTD), standby, high voltage on, and summary fault (See Figure 3-2).



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ALL CHARACTERS BLACK EXCEPT LOGO WHICH IS RED  
 ( ) COLOR OF BACKGROUND WHEN ILLUMINATED  
 RATED: VOLTAGE 14 VDC, CURRENT 200 ma  
 AVG. BRIGHTNESS 220 FOOT LAMBERTS

FIGURE 5-21 STATUS INDICATOR DISPLAY A6

0921-8/84

The remote control PWB schematic is in Section 7. The operation of the local/remote switching is discussed in Section 5.2.7.2. The remote indicators are actuated by form C relay contacts of relays K1, K2, K3, K4, and K6. When the appropriate circuit on logic board A1 is energized (see 5.2.7.6 and 5.2.8.2), the same transistors A1Q3, Q6, Q6, Q7 drive the local indicators and the appropriate remote control PWB relays which close the circuit through the relay contact for the remote status indication.

The control inputs are High Voltage ON and OFF and an external interlock circuit.

Relays 1A6K6 and 1A6K8 are used for control purposes. Form C contacts actuated by these relays provide the internal PA signals. The relays provide isolation in between the internal logic and the external command lines. A customer supplied switch is connected between the relay and the 12 VDC return line. Closing the switch actuates these relays which then controls the PA operation.

### 5.3 RF SECTION

#### 5.3.1 General

A wide variety of available RF configurations, options, and special features are described in this section. Note that gain and power are generally reduced with these options (refer to the TWTA Test Specifications) See the Special Features section of this manual for further information on the RF Section. Section 5.3.2 contains some general information on the operation of the TWTs used in the 6900G Series Units.

### 5.3.2 General Discussion of TWT Operation

A sketch of a basic helix traveling wave tube is shown in Figure 5-22. TWTs operate in the following manner: Electrons are emitted by the cathode and are accelerated down the center of the helix by the helix-to-cathode potential. Here, they interact with the RF input signal traveling down the helix at approximately the same speed as the electron beam through the helix. The interaction between the electron beam and the RF wave results in a transfer of energy from the beam to the helix RF wave. Upon traversing the length of the helix, the electrons (now traveling somewhat slower due to the energy given to the RF wave) strike the collector and are returned to the power supply. The process of continual interaction between the radio frequency wave on the helix and the electron beam results in an RF amplifying device without many of the gain bandwidth limitations of ordinary electron tubes.

The TWT will operate properly within a relatively limited range of helix voltage. This voltage must be well-regulated and filtered to avoid injecting spurious outputs onto the RF wave.

### 5.3.3 Optional High VSWR Protection

Two forms of optional protection are available:

- a. A circuit that will trip when reflected power exceeds a specified level.
- b. An RF circulator and dissipative load that can withstand full reflection of the TWT output power.

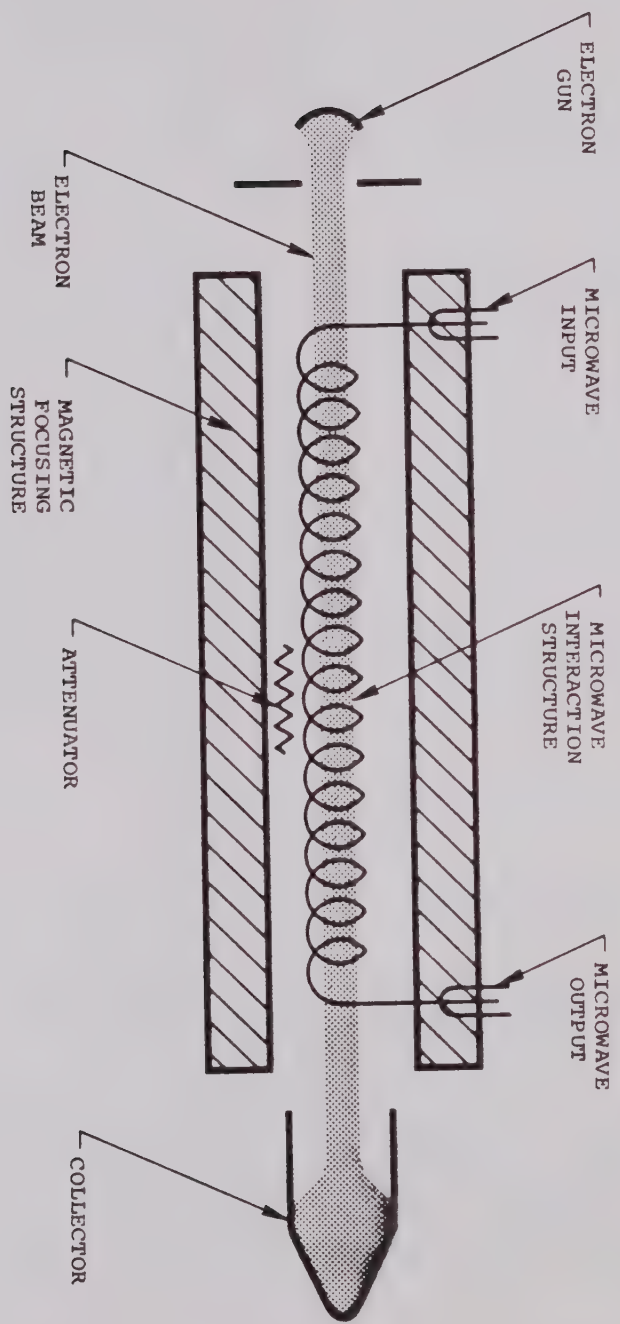


FIGURE 5-22 BASIC HELIX TWT

0922-8/84

5.3.3.1 High VSWR Trip (Option M). Refer to the RF schematic in Section 7. A coupler with a reverse power port is added on the output side of the RF section. The coupler is connected to a low pass filter which is connected to a fixed attenuator that is connected to a tunnel diode that converts the RF signal into a proportional DC output voltage. The output of the tunnel diode connects to one leg of a comparator (1A1U7BV) on the logic board. The other leg of the comparator is connected to a resistor 1A1R6 that can be used to set the VSWR trip point. The specific components selected for a particular PA are a function of the power and frequency range of the specific PA.

5.3.3.2 Full Reflected Power Protection (Special Option). A three port circulator is added to the output side of the RF Section. The reverse power port of the circulator is connected to a dissipative load that will handle approximately twice the nominal rated power of the PA. Both the circulator and dissipative load are frequency sensitive and are chosen for the particular TWT power and frequency range.

#### 5.3.4 Elapsed Time Meter (Option H)

An AC elapsed time meter that is designed for either 50 or 60 Hz operation is available. The operating frequency must be specified by the customer at the time of purchase. The elapsed time meter operates when the prime power CBI is in the ON position.

5.3.5 Input Isolator (Option A) A microwave isolator is placed in series with the RF input to the TWT. This device, consisting of a circulator and an internal load, directs the reflected power from the TWT circuitry to its load (thereby lowering the VSWR seen at the RF input to typically 1.3 : 1).

5.3.6 Input RF Attenuator (Option B) A variable RF attenuator is connected in series with the RF input to the TWT. The attenuator is mounted on the front panel for direct operator access and allows the TWTA RF gain to be controlled



over a range of typically 25 dB for all but the VZL-6943G Series (which is typically 15 dB).

5.3.7 RF Output Sample Port (Option E) A directional coupler is included in the output line from the TWT to provide a nominal -40 dB RF sample. The sampled power is fed to the front panel connector for customer monitoring. Calibration data of the sample port is taken during final test of the unit and is recorded on the TWT Test Data Sheet.

5.3.8 Solid State Driver Amplifier (Option L) Refer to the "Solid State Option Kit Drawing in Section 7. A microwave solid state amplifier (SSA) is connected in series with the RF input to the TWT which serves as a pre-amplifier. A fixed attenuator and a low-pass filter are installed between the SSA and the TWT to improve the VSWR. The low-pass filter also eliminates the possibility of damage to the SSA from backward wave oscillations (which may occur during turn-on and turn-off of the TWT).

5.3.9 PIN Diode RF Muting Switch (Option N) A PIN diode switch is connected in series with the RF input to the TWT. This allows high speed modulation of the RF drive. The control is via a BNC connector on the rear of the PA. The control signal is TTL compatible with the following characteristics:

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| Switching Speed | Less than 10 microseconds                                |
| Control Logic   | -0.3 to +0.7 VDC for RF ON; +2.5 to +5.0 VDC for RF OFF. |
| Input Current   | 3.2 milliamperes sink; 80 microamperes source.           |





## MAINTENANCE AND TROUBLESHOOTING

Instructions for maintenance of the PA are presented for the functions of: Preventive Maintenance; Adjustments and Calibrations; and Corrective Maintenance, which includes troubleshooting and repair.

In the event that repair and/or modification of this amplifier is not performed by Varian or under Varian's direction, the warranty of the unit may be voided at Varian's sole discretion. See warranty information included at the back of this manual.

If the system is not operating properly and if you cannot or do not intend to service it yourself, contact your nearest Varian field office for assistance.

```

WARNING

LETHAL VOLTAGES UP TO 15 KV ARE PRESENT WHEN POWER
IS APPLIED TO THE SYSTEM. BE EXTREMELY CAREFUL
WHEN WORKING INSIDE THE UNIT. USE ONLY ONE HAND TO
MAKE MEASUREMENTS OR ADJUSTMENTS. IF POSSIBLE,
TURN POWER OFF BEFORE MAKING ADJUSTMENTS. DO NOT
ATTEMPT TO REPAIR OR TROUBLESHOOT THIS UNIT UNLESS
YOU HAVE HAD EXPERIENCE IN SERVICING BOTH MICRO-
WAVE AND HIGH VOLTAGE SYSTEMS.

```

NOTE

Do not disturb the lower mounting bolts of the Logic PWB A1. They do not have to be loosened or changed to remove the logic board.

When the upper nuts of the logic board are removed, the board may be slipped out and the upper nuts used to fasten the slotted end of the board to the chassis for maintenance access.

### 6.1.1 Access for Maintenance

The PA is designed as a self-contained unit that can be bench or rack-mounted. The unit is covered to provide proper thermal balance and cooling. The top and bottom covers must be removed for access for the maintenance procedures described in this section.

High voltage interlock switches are installed so that removal of either cover will automatically turn-off the high voltage supply. These interlocks can be defeated by pulling out the pressure finger of the interlock switches.

```


TREAT THE OPEN UNIT AS THOUGH HIGH VOLTAGE WAS ON
WHENEVER THE COVERS ARE OFF THE UNIT.


```





TABLE 6-1  
TEST EQUIPMENT REQUIRED

| <u>EQUIPMENT</u>                   | <u>MFG.</u>       | <u>MODEL</u> |
|------------------------------------|-------------------|--------------|
| <u>General Item</u>                |                   |              |
| Sweep Oscillator Main Frame        | H.P.              | 8620C        |
| Frequency Counter                  | H.P.              | 5340A        |
| Power Meter                        | H.P.              | 435A         |
| Power Sensor                       | H.P.              | 8481H        |
| Digital Voltmeter                  | Data Precision    | 245          |
| Voltage Divider                    | Fluke             | 80F-15       |
| Oscilloscope                       | Tektronix         | 475          |
| High Voltage Monitor               | Varian Associates | 133522       |
| Power Supply, 0-160 VDC,<br>200 mA | H.P.              | 6207B        |
| <u>Frequency Dependent Items</u>   |                   |              |
| <u>Frequency Plug-In:</u>          |                   |              |
| 0.01 - 1.4 GHz                     | H.P.              | 8622A1B      |
| 2.0 - 8.4 GHz                      | H.P.              | 86240A1B     |
| 8.0 - 12.4 GHz                     | H.P.              | 86250D       |
| 12.4 - 18.0 GHz                    | H.P.              | 86260A       |
| <u>Couplers</u>                    |                   |              |
| <u>Waveguide:</u>                  |                   |              |
| 8.0 - 12.4 GHz                     | H.P.              | X752D        |
| 12.4 - 18.0 GHz                    | H.P.              | P752D        |
| 8.0 - 18.0 GHz                     | Technicraft       | TDR 14011    |
| 4.8 - 11.0 GHz                     | Technicraft       | TDR 22001    |
| <u>Coax:</u>                       |                   |              |
| 0.9 - 2.2 GHz<br>Series            | Narda             | 3042B        |
| 1.7 - 4.2 GHz<br>Series            | Narda             | 3043B        |
| 3.7 - 8.3 GHz<br>Series            | Narda             | 3044B        |
| 8.0 - 12.4 GHz<br>Series           | Narda             | 3045C        |
| 12.4 - 18.0 GHz<br>Series          | Narda             | 3096         |
| <u>Adapters - W/G To Coax</u>      |                   |              |
| 8.0 - 12.4 GHz                     | H.P.              | X281A        |
| 12.4 - 18.0 GHz                    | Narda             | 609          |

TABLE 6-1 (Continuation)

| <u>EQUIPMENT</u>                 | <u>MFG.</u> | <u>MODEL</u> |
|----------------------------------|-------------|--------------|
| <u>Frequency Dependent Items</u> |             |              |
| Low Pass Filters                 |             |              |
| 1.5 GHz                          | Microlab    | LA-15N       |
| 2.0 GHz                          | Microlab    | LA-20N       |
| 3.0 GHz                          | Microlab    | LA-30N       |
| 4.0 GHz                          | Microlab    | LA-40N       |
| 6.0 GHz                          | Microlab    | LA-60N       |
| 12.0 GHz                         | Microphase  | LTP1200AB    |
| Variable Attenuators             |             |              |
| 1.0 - 8.0 GHz                    | Merrimac    | AU26A        |
| 7.0 - 11.0 GHz                   | Merrimac    | AU26H        |
| 12.0 - 18.0 GHz                  | ARRA        | 9804-20X     |
| High Power Loads                 |             |              |
| Waveguide:                       |             |              |
| 8.0 - 12.4 GHz                   | Narda       | 320B         |
| 12.4 - 18.0 GHz                  | Narda       | 319B         |
| Coax:                            |             |              |
| 0.7 - 12.4 GHz                   | Narda       | 369B         |
| 2.0 - 12.4 GHz                   | Narda       | 368          |
| Termination                      |             |              |
| DC - 12.4 GHz                    | Narda       | 377N         |



TABLE 6-2

## VISUAL INSPECTION ITEMS

| <u>ITEM</u>                 | <u>POTENTIAL FAULT</u>                            | <u>CORRECTIVE PROCEDURE</u>                                                  |
|-----------------------------|---------------------------------------------------|------------------------------------------------------------------------------|
| Connector Plugs             | Damaged or improperly seated in mating connectors | Replace connector plugs, properly seat replacement plug                      |
| Electrical Wiring           | Broken, burned or pinched                         | Repair or replace defective wires                                            |
| Soldering Connection        | Corroded, cracked or dirty                        | Clean and resolder connections                                               |
| Dirt or Moisture Buildup    | Short circuits, arcing, corrosion overheating     | Cleaning (see Table 6-3)                                                     |
| Status Indicator Lamp Lamps | Failure or open circuit                           | Replace defective per paragraph 5.2.9, check and clean contacts as required. |



TABLE 6-3

## ROUTINE CLEANING PROCEDURE

| <u>ITEM</u>                                                           | <u>PROCEDURE</u>                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chassis                                                               | Clean with lint-free cloth, small vacuum cleaner or low pressure (25 psi, maximum) compressed air.                                                                                                                                         |
| Front Panel Controls & Meters                                         | Use a dry, clean cloth, a soft-bristle brush, or a cloth moistened with warm water and soap or a similar cleaning compound. Use a Kimwipe tissue (or equivalent) and GTC glass cleaning compound (or equivalent) to clean the meter faces. |
| Wire Bundles & Wiring                                                 | Clean with a soft-bristle brush, small vacuum cleaner or low                                                                                                                                                                               |
| pressure compressed air.                                              |                                                                                                                                                                                                                                            |
| Connector Jacks & Plugs                                               | Remove dust and dirt with a soft-bristle brush, a small vacuum cleaner or low pressure compressed air.                                                                                                                                     |
| Circuit Boards                                                        | Clean with a dry, soft-bristle brush, a small vacuum cleaner, or low-pressure compressed air.                                                                                                                                              |
| Waveguide Assemblies, Clamps, Cables, and Rubberized or Plastic Parts | Use low-pressure air or a vacuum cleaner to remove excess dust and dirt. As an alternate, clean with a soft bristle brush and lint-free cloth moistened with warm water and soap.                                                          |

### 6.2.3 Lubrication

Chassis slides may occasionally require lubrication. To perform this maintenance, clean the slide mechanism with isopropyl alcohol or other approved solvent; use a small stiff-bristle brush to apply a light coat of Lubriplate No. 110 (or equivalent). Wipe off excess lubricant with a clean lint-free cloth. No other lubrication is required for the PA.

### 6.2.4 Paint Touch-Up

Most finish repairs consist of retouching minor marred or scratched surfaces. A "camel hair" brush lightly dipped in a suitable enamel will accomplish the touchup desired. Deep scratches, chips, and gouges should first be removed or smoothed by a light sanding with fine (No. 00 or 000) sandpaper and then the surface may be painted as required to restore the finish. Varian's standard paint color is light grey #26440 per Federal Standard 595.

## 6.3 ADJUSTMENTS AND CALIBRATION

### 6.3.1 General

Adjustment and calibration of the Power Amplifier is required when TWT or a major assembly is replaced or after major repairs have been made. No adjustment procedure should be attempted until the Theory of Operation section of this manual is read and the function of the circuits and circuit adjustments are fully understood. A Test Data Sheet (Test Performance Sheet) is supplied with each PA. This sheet contains information on the proper voltages, currents and other parameters that are to be used when adjusting or calibrating the PA.



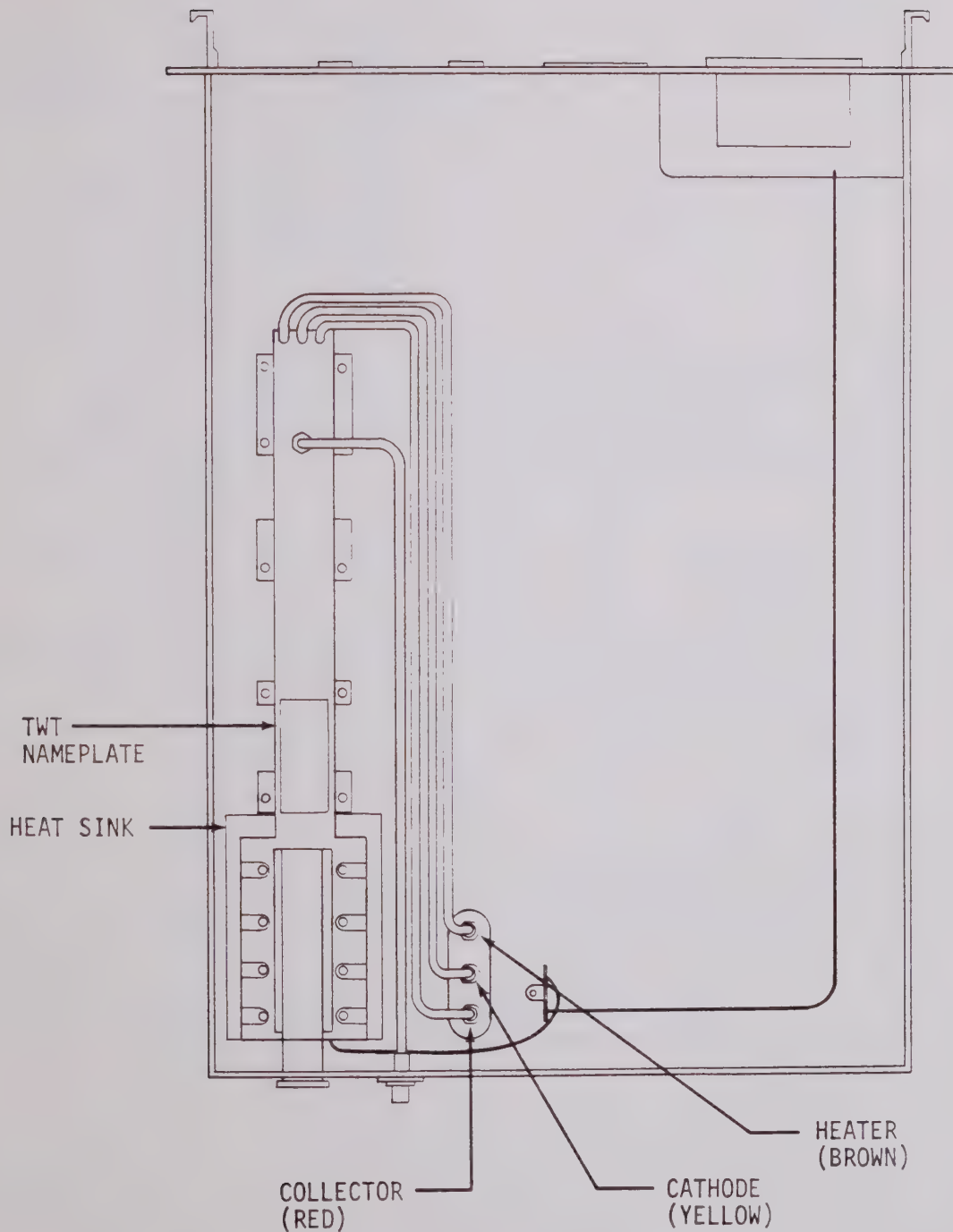


FIGURE 6-1 TWTA/POWER SUPPLY INTERCONNECTORS

0923-8/84

TABLE 6-4

## SUMMARY OF ADJUSTMENT PROCEDURES

| <u>Function</u>                                           | <u>Location of Control</u> | <u>Procedure * Reference</u>    |
|-----------------------------------------------------------|----------------------------|---------------------------------|
| Set No-load Regulator                                     | A2R30 on A2 PWB            | Sec. 6.3.4.1<br>step a.         |
| Set TWT Helix Voltage                                     | A3R53 on A3 PWB            | Sec. 6.3.4.7<br>steps a thru i. |
| Set Switch Regulator Peak Current Limit Point             | A3R5 on A3 PWB             | Sec. 6.3.4.10                   |
| Adjust Switch Regulator (-200 VDC) Overvoltage Trip Point | A2R38 on A2 PWB            | Sec. 6.3.4.11                   |
| Adjust for minimum 60/120 Hz Ripple                       | A3R29 on A3 PWB            | Sec. 6.3.4.9                    |
| Set Filament (Heater) Voltage                             | A4R3 on A4 PWB             | Sec. 6.3.4.7<br>steps a thru e. |
| Set Filament Surge Limit Current                          | Jumper on A4 PWB           | Sec. 6.3.4.15                   |
| Set Converter Over-current Trip Point                     | A4R18 on A4 PWB            | Sec. 6.3.4.12                   |
| Adjust Helix Trip Point                                   | A1R3 on A1 PWB             | Sec. 6.3.4.13                   |
| Adjust VSWR Trip Point                                    | A1R6 on A1 PWB             | Sec. 6.3.4.14                   |

\* Also refer to Test Performance Sheet that accompanies each PA.



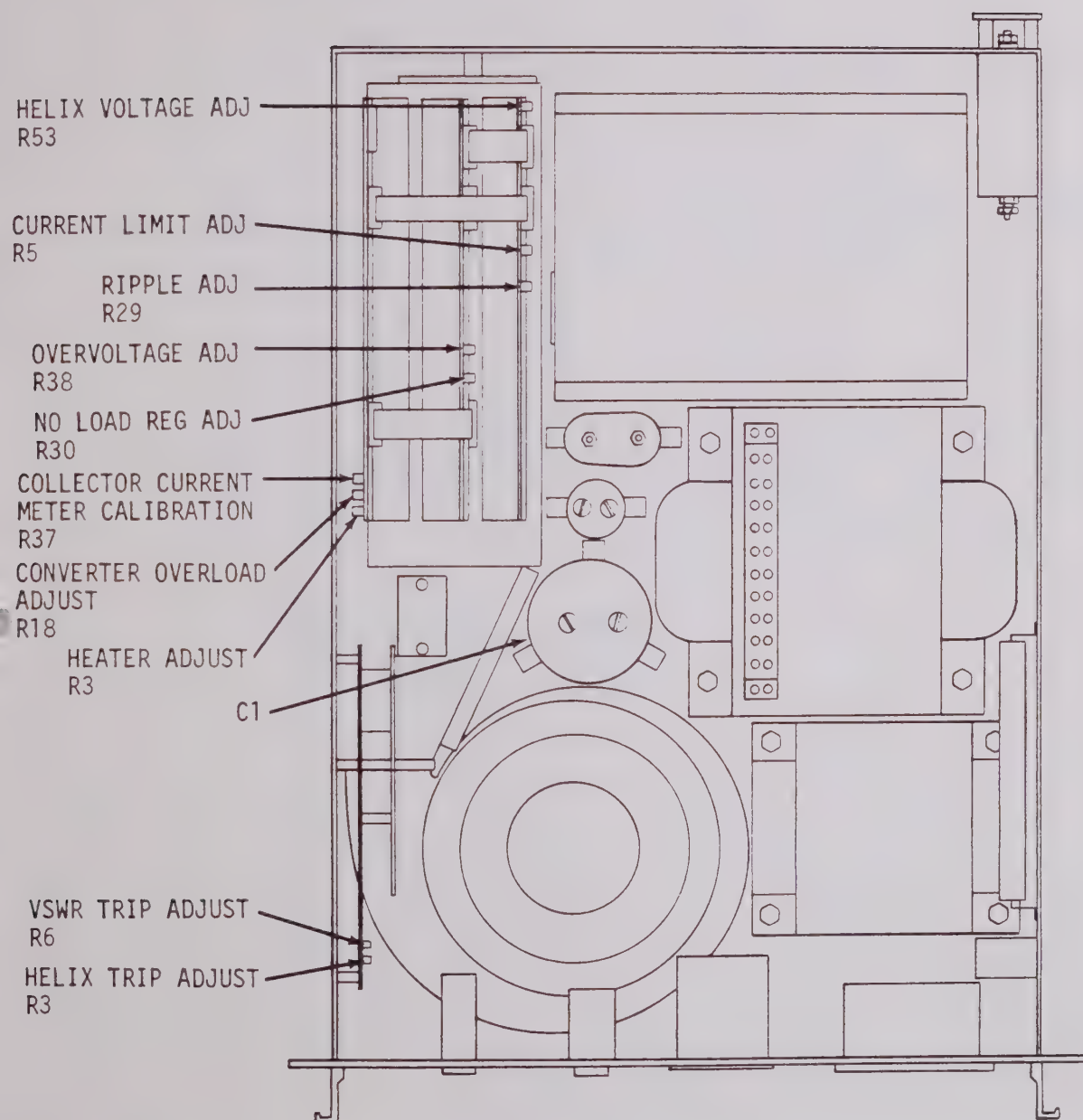


FIGURE 6-2 TWTA POWER SUPPLY ADJUSTMENTS

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- a. Remove all power from the power amplifier and wait 30 seconds to allow all voltages to discharge.
- b. Loosen the fittings on the input and output of the TWT.
- c. Disconnect the TWT high voltage connectors from the high voltage module J1, J2, J3.
- d. Disconnect the two wires that go to TB2 mounted next to the heatsink.
- e. Unscrew the TWT from the PA chassis and lift out the TWT.
- f. Install new high voltage male connectors to the TWT leads as shown in Figure 6-3. Proceed as follows:
  - 1) Install pin on lead and crimp in place.
  - 2) Coat the lead insulation with a small amount of RTV 3145 Sealant keeping the barrel of the pin free of sealant.
  - 3) Insert the pin into the HV connector. Verify that it locks into place.
  - 4) The sealant will set up in three to four hours. Try not to disturb for 24 hours to produce a full cure.

Clean off all of the thermal compound from the heatsink. Apply a very thin coat of new thermal compound (Wakefield No. 120 or equivalent) to the heatsink and the replacement TWT. Install the replacement TWT in the reverse order specified above. The wires to J1, J2, J3 are color coded. See label on chassis adjacent to these connectors and match wire colors to label. Be sure that all screws are tight for the heatsink and the TWT and that there is a thin coating of thermal compound applied.

6.3.3.2 Module and Component Replacement. The printed circuit boards, modules, RF components and miscellaneous can be completely removed or replaced using simple assembly techniques. Several cautions, however, should be noted.

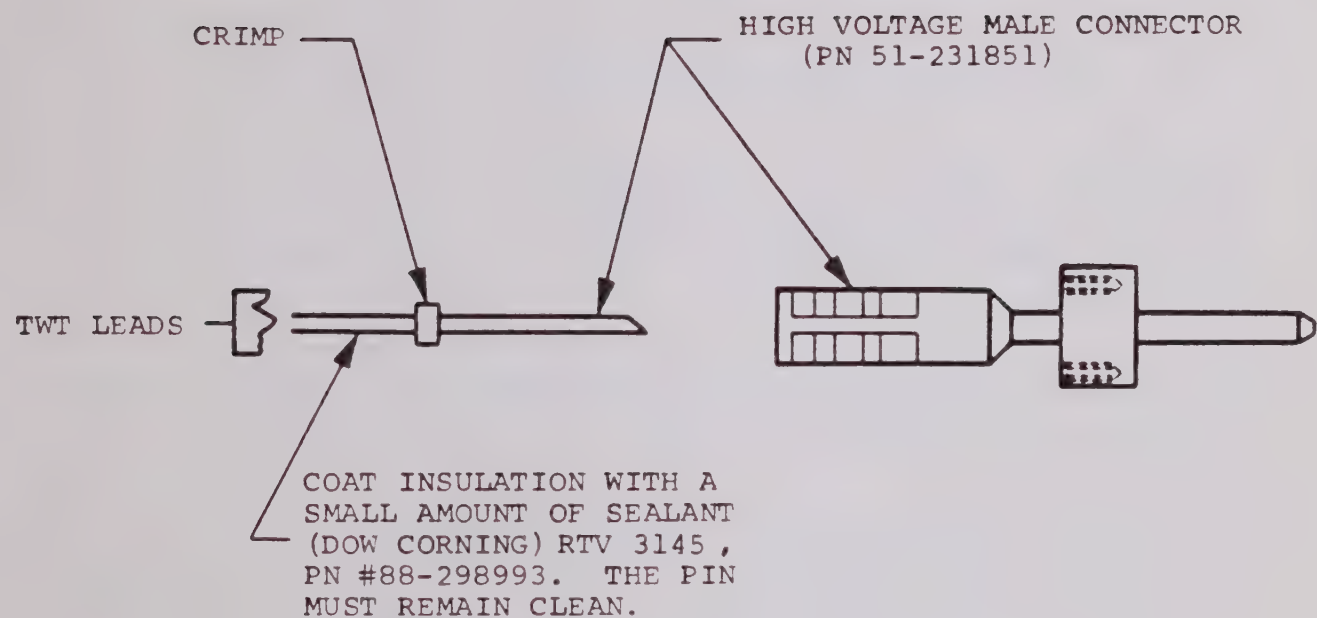


FIGURE 6-3 INSTALLATION AND POTTING OF HV CONNECTORS

0925-8/84

- a. Upon reassembly, all screws should be snug.
- b. All components with thermal compound must be cleaned and a thin coating of new thermal compound reapplied. (Use Wakefield No. 120 or equivalent).
- c. All solder connections must be mechanically and electrically sound.
- d. All connections must be completely installed and properly seated.

#### 6.3.4 Adjustment After Major PA Repairs

After major repair, the power supply is made operational by disconnecting the various sections of the circuit, making the necessary adjustments, and reconnecting the circuits in a logical sequence.

The basic operations that are discussed in detail in the following sections are as follows:

- a. Check 300 VDC and 38 VDC voltages.
- b. With the input to the switch regulator disconnected, the  $\pm$  VDC, -30 VDC, 29 VAC and +12 VDC voltages are checked.
- c. The 200 V undervoltage protection, switch regulator, and converter drive signals are checked with the input to the switch regulator disconnected.
- d. With the switch regulator connected and the bridge converter disconnected, the switch regulator output voltage, current limit point and 200 V overvoltage protection are set and checked.
- e. The bridge converter is connected, primary waveshape checked.

- f. With the TWT disconnected, the high voltage is turned on and helix to cathode voltage is checked and preadjusted.
- g. The TWT heater current surge limit jumper position is verified; the TWT is connected. The TWT heater voltage is checked with the high voltage off.
- n. The high voltage is turned on. Helix voltage is set to the TWT specification.
- i. Helix to cathode ripple is adjusted to minimum.

Specific procedures are outlined below.

#### NOTE

Remove power and disconnect TWT at J1, J2 and J3 on HV Module before proceeding.

#### 6.3.4.1 300VDC and 38VDC Measurement Checks. (See Figure 6-2, Dwg. 113979)

- a. Connect VOM across C1 (Figure 6-2), positive to red lead (common) negative to black lead (-300V). If the switch regulator card is disconnected by removing A3P2, then connect a jumper from C1(+) to C2(+).
- b. Turn-ON CB-1. Set OPERATE/OFF/RESET switch to OFF/RESET. Voltage will be 300 VDC  $\pm$  10 VDC. Omit steps b.1, b.2, and b.3 if voltage is greater than 50VDC. Check operation of bleeder at this point by turning off CB-1; voltage should discharge in less than 30 seconds.
  - b.1 If, when CB1 is turned-on, the 300 DC reaches approximately 225 VDC and then drops to zero, there is a problem producing an SCR shutdown.



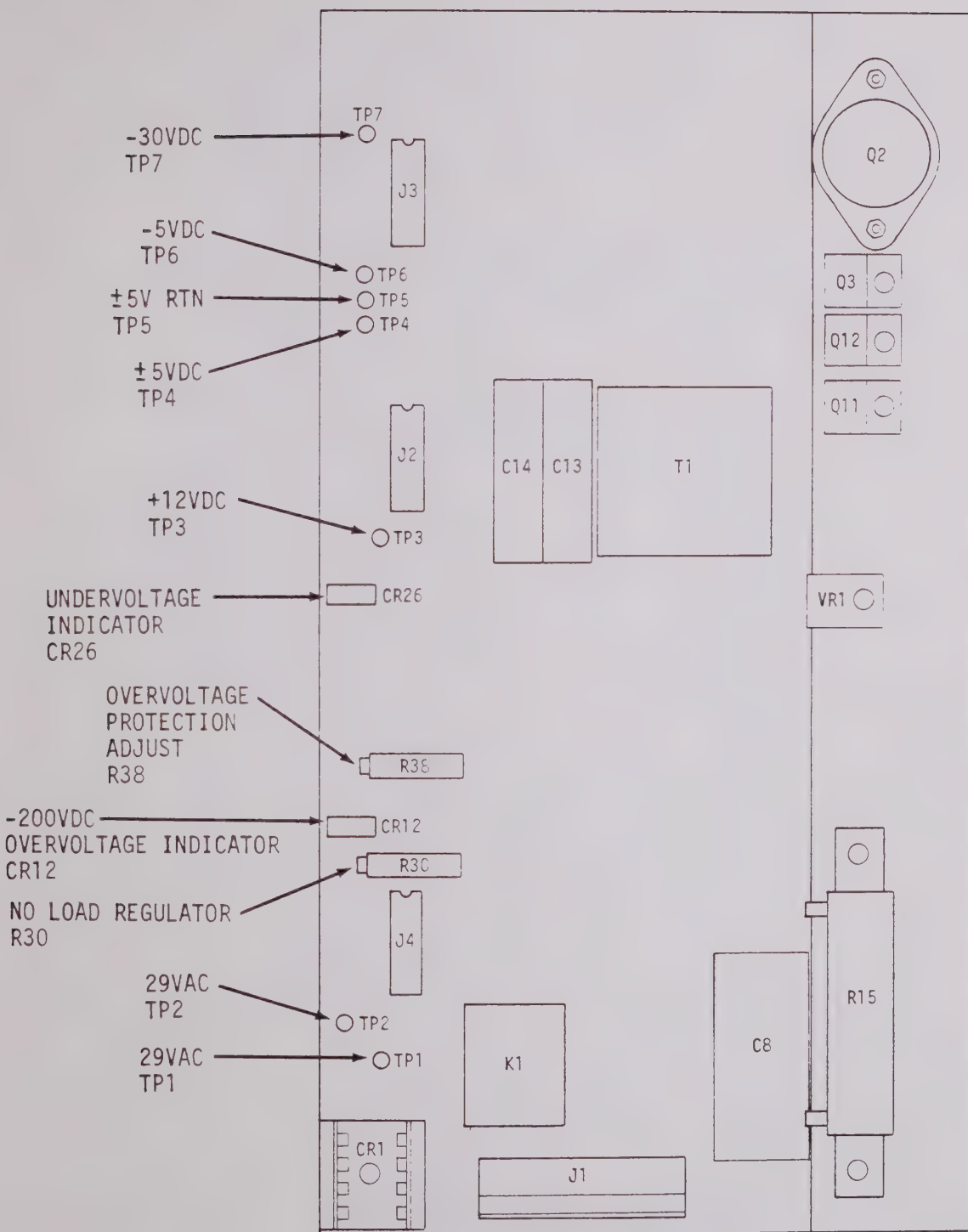
- b.2 Turn-OFF CB1. Wait 30 seconds. Remove from C1 (negative) the black lead that goes to the switch regulator (A3) assembly, Figure 6-2.
- b.3 Turn-ON CB1 and measure 300 VDC - 10 VDC across C101.
- c. If the 300 VDC needs adjustment, adjust A2R30 to read 300 - 10 VDC on VOM.
- d. Turn-OFF CB1. Wait 30 seconds. Connect VOM across C2, Figure 6-2.
- e. Turn-ON CB1 and read 45 VDC - 5 VDC.
- f. Turn-OFF CB1. Wait 30 seconds, disconnect VOM.
- g. Remove VOM.

#### NOTE

Some of the early units do not include all the test points (TP) referenced in the following procedures. Where appropriate, an equivalent connection point is noted in parenthesis next to the TP of interest.

#### 6.3.4.2 30 VAC, -30 VDC, +12 VDC and + VDC Checks (See Figure 6-4, Drawing 113483)

- a. Turn-OFF CB1 and wait at least 30 seconds.
- b. Disconnect input to switch regulator at C1 (black lead to C1 negative).
- c. Refer to assembly drawing 113483.
- d. Locate J3 and connect VOM/DVM to the following pins: Turn-ON CB1 and read:
  - 1. TP-7 (or A2J3-13) to chassis. Read  $-30 \pm 1.5$  VDC.
  - 2. TP4(+) to TP5(-) or A2J3-8(+) to A2J3-6(-). Read +5 to +10 VDC.



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FIGURE 6-4 OSC/BIAS PWB A2 ADJUSTMENTS AND TEST CONNECTIONS

3. TP5(+) to TP6(-) or A2J3-7(-) to A2J3-6(+).  
Read -5 to -10 VDC.

- e. Locate A2J4 and connect VOM/DVM from TP-3(+) (or A2J4-7(+)) to chassis. Read +12 VDC  $\pm$  1 VDC.
- f. Locate J4 and connect scope from TP-1 (or J4-3) to chassis. Read 60V p-p square wave at 10 KHz  $\pm$  1.5 KHz.

#### 6.3.4.3 Check the 200 Volt Undervoltage Circuit, Switch Regulator and Converter Drive Signals. (See Figure 6-4, Dwg. 113483)

- a. Turn-OFF CBI and wait at least 30 seconds.
- b. Disconnect black lead from the switch regulator to C1 (negative).
- c. Turn-ON CBI, wait for STDBY light. Turn-on the HV control switch. The BEAM ON light will momentarily light. The FAULT light will turn-on and LED CR26 will turn-on. This completes the functional check of the 200 volt undervoltage current.
- d. Turn-OFF CBI, wait at least 30 seconds and then connect a jumper across C19.
- e. Turn-OFF HV control and connect DVM/VOM from J3-1 (neg) to chassis.
- f. Turn-ON CBI. Read less than 1 VDC.
- g. Turn-ON HV control and read -30 VDC  $\pm$  1 VDC.
- h. Turn-OFF CBI wait at least 30 seconds. Remove jumper from C19.
- i. Reconnect input to switch regulator at C1 (negative) black wire.

#### 6.3.4.4 Check The -200 VDC Output (See Figures 6-4, 6-5 and 6-6)

- a. Turn-OFF CBI.
- b. Reconnect switch regulator input to C1 (negative) if previously disconnected.

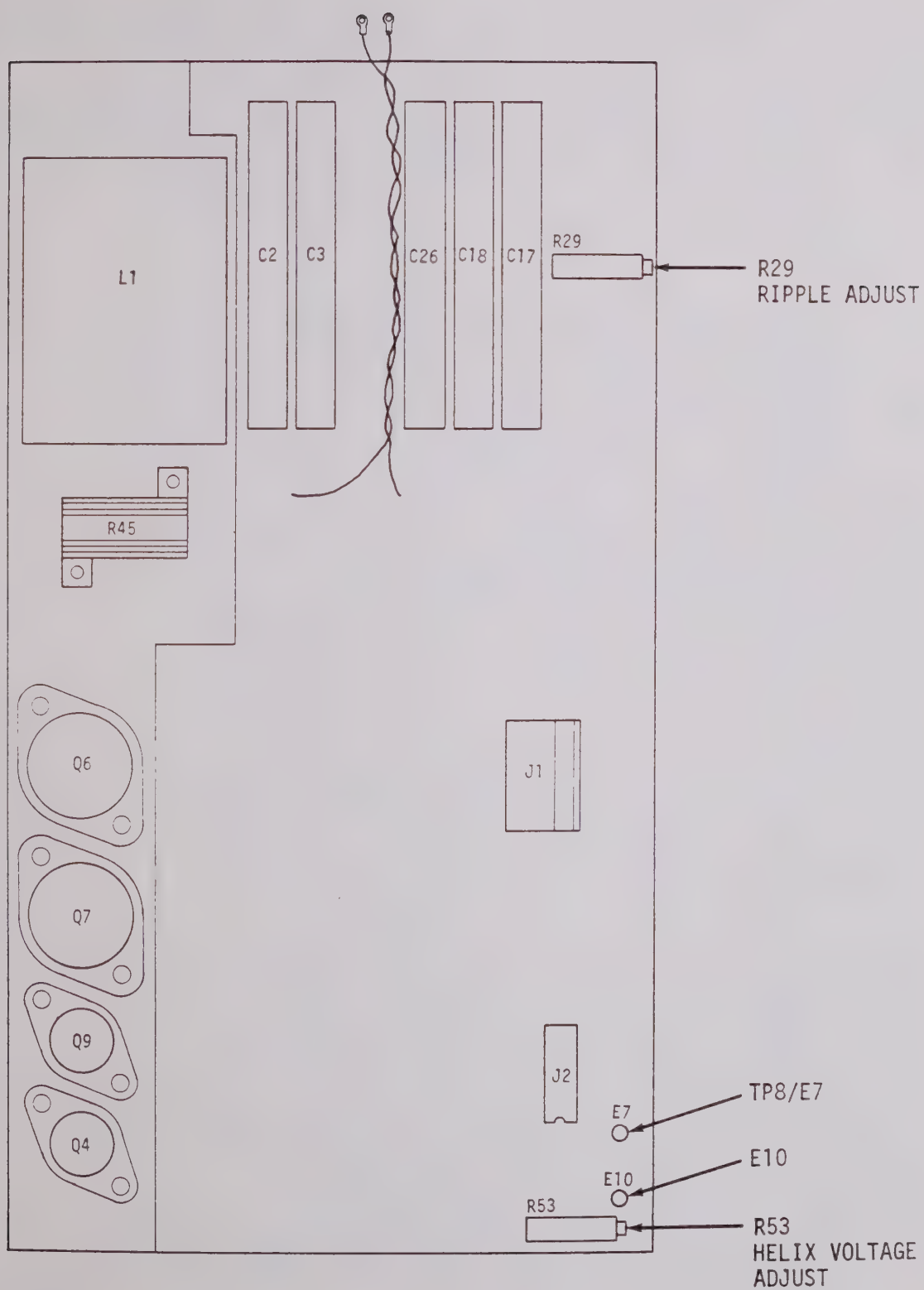
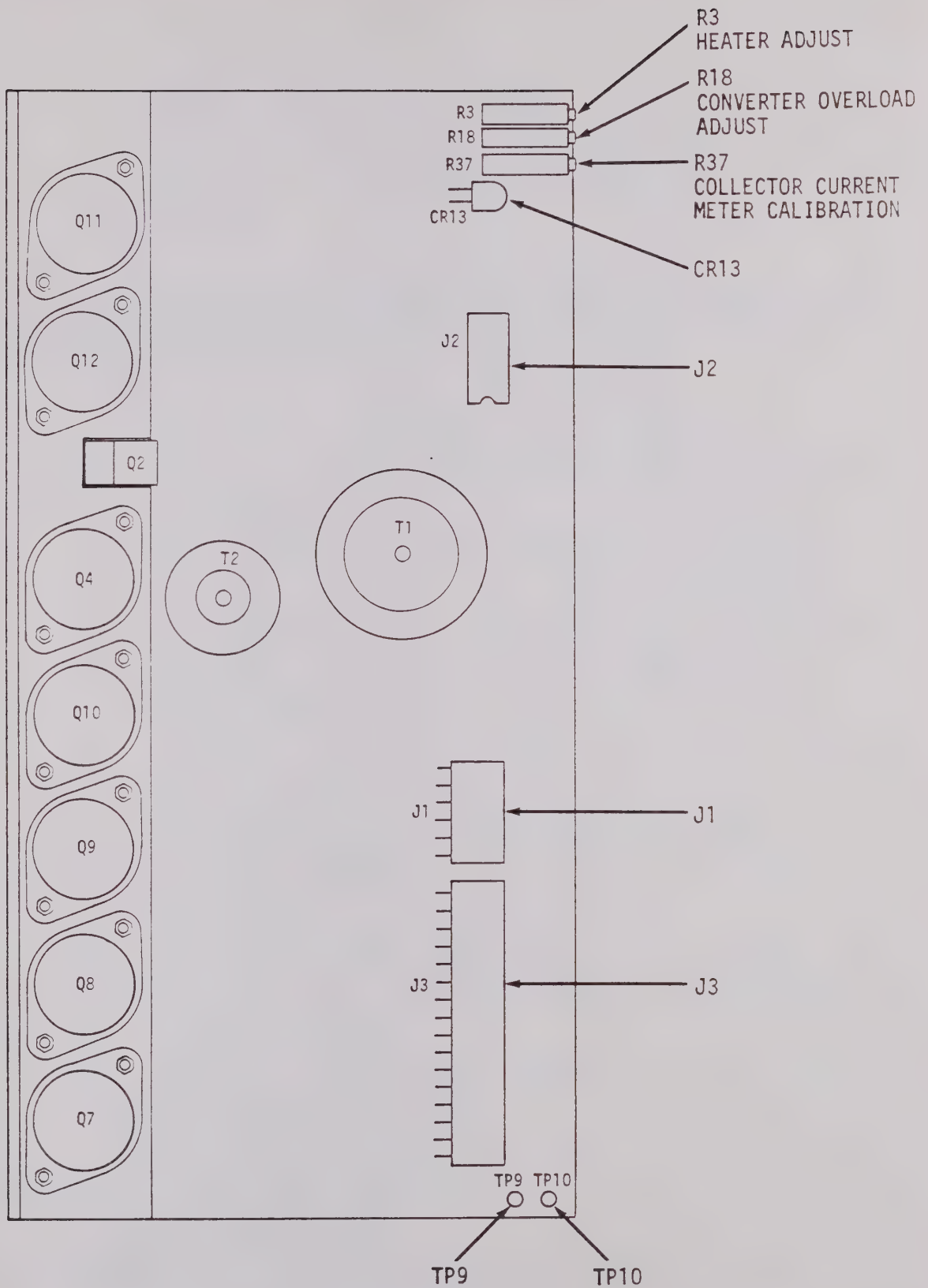


FIGURE 6-5 SWITCH REGULATOR PWB A3 ADJUSTMENTS AND TEST CONNECTIONS



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FIGURE 6-6 HV CONVERTER PWB A4 ADJUSTMENTS AND TEST CONNECTIONS  
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- c. Refer to Figure 6-6. Disconnect A4J1 from HV converter PWB A4. Connect DVM/VOM from A3E7 (TP-8) to chassis. Connect a jumper from A3E7 (TP-8) to chassis. Connect a jumper from A3E7 (TP-8) to A3E10. (The switch regulator will not operate without a load unless a jumper or a 56K resistor is placed across A3E7 (TP-8) and A3E10).

#### NOTE

The test data package that was shipped with the PA includes information on jumper connections and power supply voltages. These voltage references are used in the setup of the P.S. and for TWT mating purposes.

- d. Turn-ON CB1 and wait for standby light. Turn-ON high voltage control and read and record the switch regulator voltage for this unit at no-load. Compare this value to the no-load voltage given in the Test Data Package.

If the DVM/VOM reads voltage momentarily and then falls to zero and the logic goes to the standby position, locate LEDs CR12 and CR26.

#### NOTE

CR12 and CR26 are fault indicators. CR26 is the undervoltage protection circuit and will light and turn-off drive signals if the switch regulator output is below approximately 120 VDC. CR12 is the overvoltage protection circuit and will light and turn-off drive signals if the output is greater than approximately 240 VDC.

1. If CR26 is lit, adjust A3R53 clockwise (CW) three full turns. Turn-OFF the HV control momentarily to reset CR26. Now turn-ON the HV switch and read greater than 120 VDC.
2. If CR12 is lighted, adjust A3R53 counterclockwise (CCW) three full turns. Turn-OFF the HV switch momentarily to reset CR12. Turn-ON the HV control and read less than 240 VDC.

When you have obtained normal turn-on, return to step d.

- e. If the voltages compared in step d. are not equal within +3V, set switch regulator NO LOAD voltage to value recorded in Test Data Package using A3R53.
- f. Turn-OFF CB1. Wait 30 seconds. Remove the jumper (step c) from A3E7 and A3E10.
- g. Reconnect A4J1 to A4P1.

6.3.4.5 Check HV Input Converter. (See Figures 6-2, 6-3, Dwg. 129405). If trouble is suspected in HV converter, refer to paragraph 6.4.2).

- a. Turn-OFF CB1. Wait at least 30 seconds and connect the input of switch regulator A4 (black lead) to C1 (negative), Figure 6-2, if previously disconnected.
- b. Connect J1 if previously disconnected.
- c. Disconnect A4J3 from HV Converter (A4), Figure 6-6.
- d. Connect Jumper from E7 (TP8) to E10 on Switch Regulator A3.
- e. Connect a jumper from A4J3-1 to the chassis and from A4J3-6 to chassis.
- f. Connect the scope to A4 TP-9 (or A4J3-8) to chassis (50 V/cm vertical; 20 microsecond/cm sweep).
- g. Turn-ON CB1. Wait for STANDBY light on the front panel indicator.

- n. Turn-ON HV control. Read  $10 \text{ KHz} \pm 1.5 \text{ KHz}$  square wave on scope. Peak voltage will be equal to switch regulator output voltage.
- i. Turn-OFF HV control. Reconnect scope from TP-10 (or A4J3-11) to chassis. Turn-ON HV control. Read same 10 KHz square wave on scope.
- j. Turn-OFF CBI. Wait 30 seconds.
- k. Remove jumpers from A3E7-E10 on switch regulator, A4J3-1 to chassis, and A4J3-6 to chassis.
- l. Reconnect A4J3 to A4P3.

6.3.4.6 High Voltage Module A5 No-Load Check. (See Figure 6-7, 6-8 and Dwg. 113919).

- a. Turn-OFF CBI. Wait 30 seconds.
- b. Remove jumper from A3E7 (TP-8) to A3E10 if installed previously.
- c. Remove TWT leads P1, P2 and P3 from A5J1, J2 and J3 if not previously removed.

NOTE

The procedures in this manual that deal with high voltage measurements are based on the use of a High Voltage Monitor, Varian Part No. 133522. The High Voltage Monitor incorporates a high voltage divider, a meter and switch that allows helix and connector voltages to be measured without the use of additional equipment.

- d. Install the High Voltage Monitor by inserting plugs P1, P2, P3 on the High Voltage Monitor into the HV Module A5. (Figure 6-9). Observe the color codes on the jacks and plugs as follows:

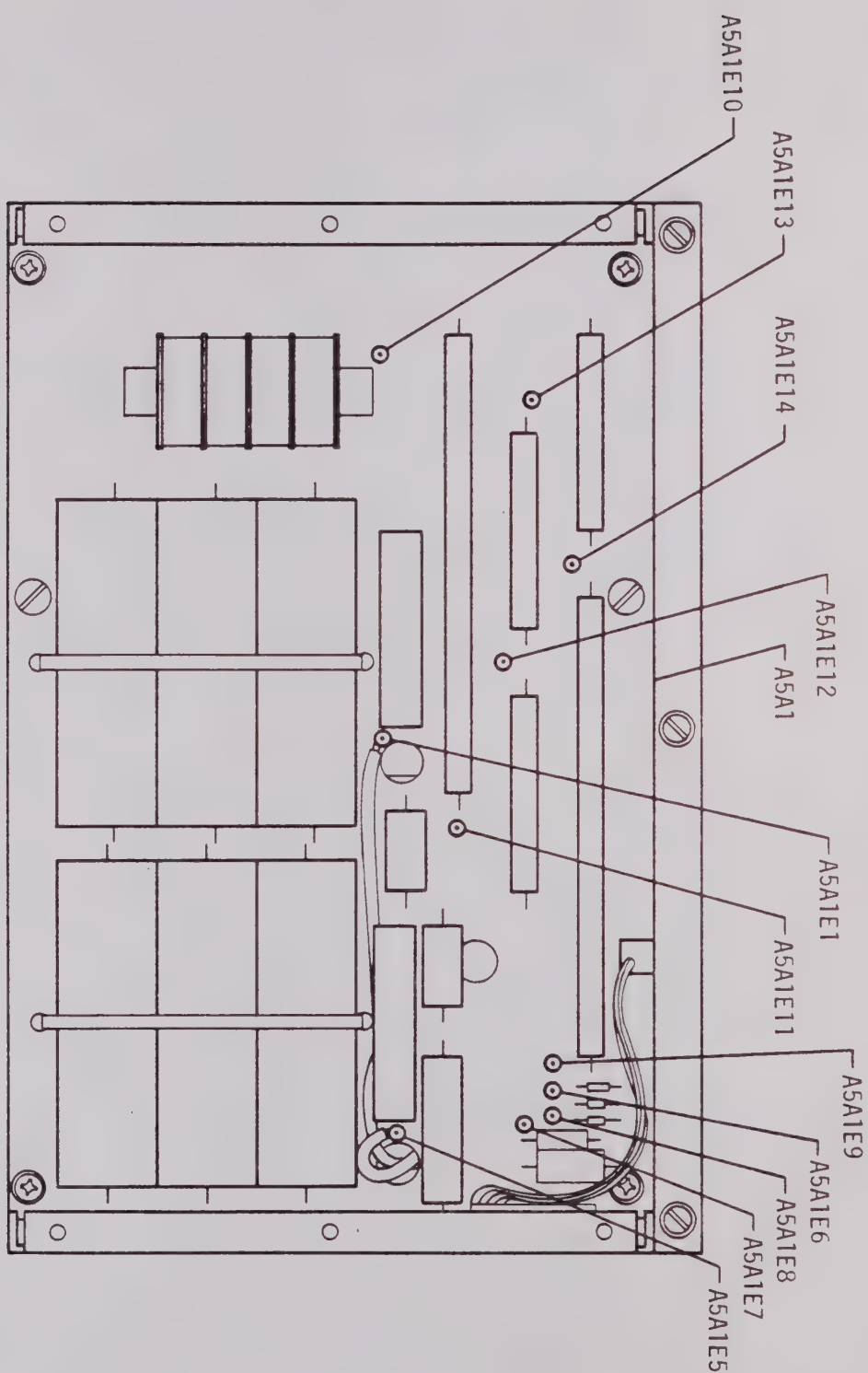


FIGURE 6-7 HIGH VOLTAGE PWB No. 1 (A5A1)

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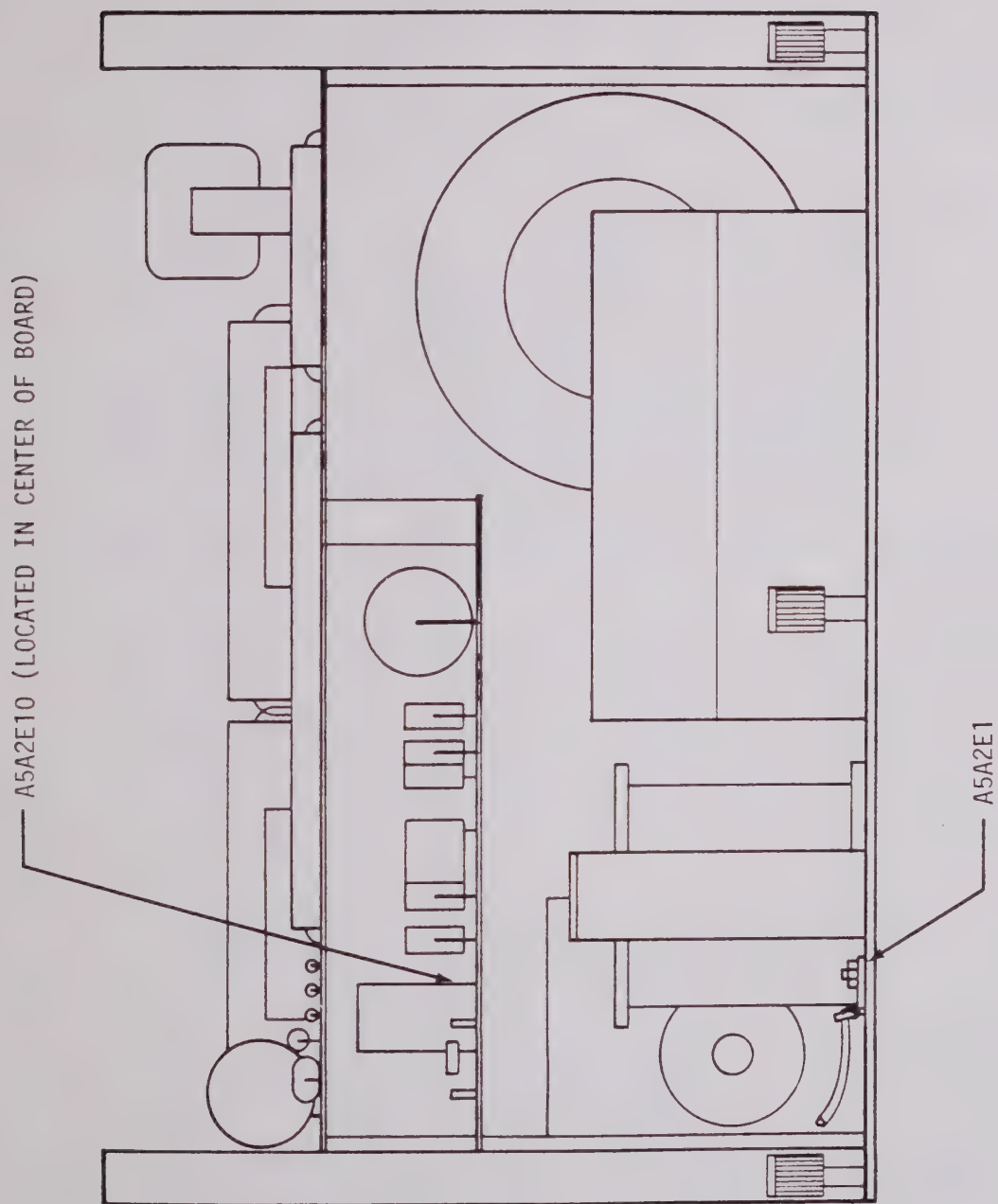


FIGURE 6-8 HIGH VOLTAGE MODULE PWB NO. 2 (A5A2)

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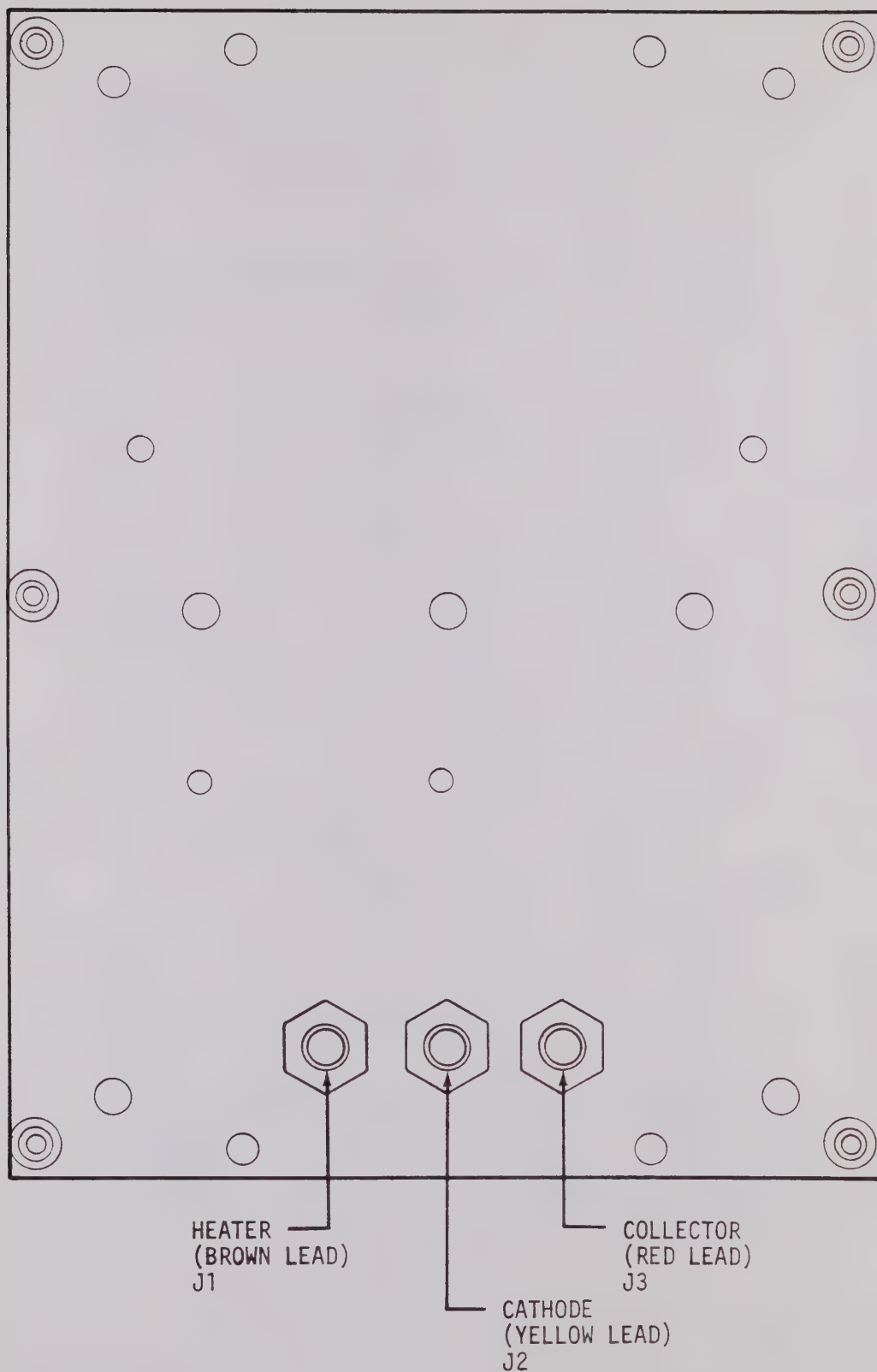


FIGURE 6-9 HV MODULE A5 CONNECTIONS

Red - Collector  
Yellow - Cathode  
Brown - Heater

- e. Install terminating plug on output connector of HV Monitor.
- f. Connect the ground lead from the HV monitor to the chassis.

```

* *
* ***** *
* WARNING *
* ***** *
* *
* THE BODY OF THE HIGH VOLTAGE MONITOR WILL BE *
* FLOATING UNLESS THE GROUND LEAD IS PROPERLY *
* ATTACHED. IN ADDITION, ANY VOLTAGE READING MADE *
* WITHOUT USE OF THE GROUND WILL BE SUSPECT. *
* *
* ***** *
* *

```

- g. Set OPERATE/OFF/RESET switch to OFF/RESET. Turn CBI on. Select HEATER position on HV Monitor. Read the unloaded heater voltage and record the value. The unloaded heater voltage reading should be approximately 10 VDC (Do not adjust at this time).
- h. Select the HELIX position on the HV Monitor. Set to OPERATE. Read the meter and record the values. This should match the value given in the test data package. If not, adjust A3R53 to give the correct value for your TWT.
- i. Switch to the COLLECTOR position on the HV Monitor. Read and record the value. All that is required is to get an indication that collector voltage is present.

#### NOTE

The No-Load collector voltage reading does not represent the loaded collector voltage reading and is used only to verify that collector voltage is being generated. The actual collector voltage reading can only be made using the TWT as a load or by using a "dummy resistive load" capable of handling the same rated power as the TWT in use in the system.

j. Turn H.V. control to OFF/RESET. Turn-OFF CB1.

#### NOTE

Leave the H.V. Monitor installed if you plan to make final adjustments and refer to paragraph 6.3.4.7. Otherwise, remove the monitor, secure the equipment and reinstall TWT leads P1, P2, P3.

6.3.4.7 Final Settings of Heater Voltage, Cathode to Helix Voltage and Collector Voltage. See Figure 6-5 and proceed as follows:

#### NOTE

This procedure requires the use of the High Voltage Monitor (Varian Part No. 133522) (Section 6.3.4.6).

If the TWT or HV module is replaced, refer to Section 6.3.4.8 for selection of proper transformer taps and to Section 6.3.4.15 for selection of heater surge current limit jumper.

- a. Turn-OFF CB1.
- b. Set HV control to OFF/RESET. Wait 30 seconds.

- c. Remove jumper from A3E7 to A3E10 of Switch Regulator A3 (Figure 6-5) if previously installed.

\*\*\*\*\*

WARNING

\*\*\*\*\*

THE MEASUREMENT OF THE CATHODE TO HELIX VOLTAGE EXPOSES THE OPERATOR TO POTENTIAL VOLTAGES AS HIGH AS 15 KV. EXTREME CAUTION MUST BE EXERCISED IN MEASURING THE HIGH VOLTAGE SECTIONS OF THIS POWER SUPPLY.

\*\*\*\*\*

- d. Connect leads P1, P2 and P3 of TWT to J1, J2 and J3 of the HV Monitor. P1, P2 and P3 of the HV Monitor should be connected to J1, J2 and J3 of HV Module A5.
- e. Connect the ground lead from the High Voltage Monitor to the chassis.

\*\*\*\*\*

WARNING

\*\*\*\*\*

THE BODY OF THE HIGH VOLTAGE MONITOR WILL BE FLOATING UNLESS THE GROUND LEAD IS PROPERLY ATTACHED. IN ADDITION, ANY VOLTAGE READING MADE WITHOUT USE OF THE GROUND WILL BE SUSPECT.

\*\*\*\*\*

- f. Turn-ON CBI. The voltmeter will read less than 6.3 VDC. As the timing cycle is completed, the voltage will increase to 6.35 VDC  $\pm$  0.1 VDC. If, after the timing cycle is complete and the logic is in STANDBY, the HV Monitor reads other than 6.35 VDC  $\pm$  0.1 VDC, locate A4R3, Figure 6-6, and adjust A4R3 to read 6.35 VDC  $\pm$  0.1 VDC.
- g. Select HELIX position on H.V. Monitor.

- n. Note Helix-to-Cathode and collector voltages in Test Data Package. Record this voltage for use later in the procedure. If the Test Data Package is not available, use the name plate values on the TWT.
- i. Set HV control on to OPERATE. Voltage on HV Monitor should be within  $\pm 0.2\%$  of voltage recorded at step n. of this procedure.
- j. If voltage needs adjustment, refer to Figure 6-5 and adjust A3R53 on Switch Regulator (A3) to the voltage indicated in step n.
- k. Select COLLECTOR position on HV Monitor and record this voltage. Compare with the recorded collector voltage on the Test Data Package

#### NOTE

The collector voltage is a tap selected percentage (see 6.3.4.8) of the cathode to helix voltage. The collector voltage read by the H.V. Divider should be within the limits for the particular TWT type in use as outlined by Table 6-5. For example, TWT type VTU-6252F1 will operate properly with any collector voltage from 28 KVDC to 3.3 KVDC. If the measured voltage falls outside the ranges in Table 6-5, refer to 6.3.4.8 for HV transformer tap selections.

- l. Turn-OFF CBI. Set HV control to OFF/RESET. Wait 30 seconds.
- m. Remove HV Monitor.
- n. Reinstall P1, P2, P3 in A5J1, J2, J3.
- o. This completes this procedure.

6.3.4.8 H.V. Transformer Tap Adjustments and Voltage Divider String Resistor Selection. If a replacement TWT or H.V. Module is to be used in the PA, the following procedure is to be used in re-adjusting the helix-cathode and collector to cathode potentials.

- a. Compare the new voltage requirements with the previous TWT voltages. If they are comparable (within a few percent) tap adjustments and jumper changes are probably not required. In this case, proceed to Section 6.3.4.7. If the correct voltages cannot be obtained in section 6.3.4.7, perform steps b. through h.
- b. Remove all power from the PA.
- c. Disconnect all connections to the HV Module A5 and remove this assembly from the PA by unscrewing six captive fasteners.
- d. Remove top and side covers from HV Module.
- e. Refer to Table 6-5. Select the TWT type. Find the corresponding connections to transformer A5-T2 and the jumper connections on A5-A1.

#### NOTE

The wires are color-coded that connect to the H.V. transformer. The colors are violet, gray and blue.

- f. Check the top PCB of the HV Module (Figure 6-7) to make sure the jumpers installed on the "E" terminals agree with the callouts in Table 6-5. If not, remove all old jumpers and install new jumpers



between the correct "E" terminals. (The "E" number represents the terminals on the HV module PCB that must be connected when selecting the voltage divider resistance to be used).

- g. Check the connections to A5-T2 to make sure that the violet, grey and blue wires are connected as indicated in Table 6-5. If not, disconnect these and reconnect to the correct taps.
- n. After the transformer taps and the resistors for the voltage divider string have been selected, refer to Paragraph 6.3.4.6 to set the helix-to-cathode voltage and 6.3.4.7 to check the collector-to-cathode voltage.

#### NOTE

TWT Types VTC-6242F1, VTC-6232F1, and VTS-6250F1 require two separate combinations of the divider string to allow adequate adjustment range of the helix-to-cathode voltage as shown on the Table 6-5. Select the combination that gives the desired helix-cathode voltage for your TWT.

#### 6.3.4.9 Setting of Ripple Adjustment

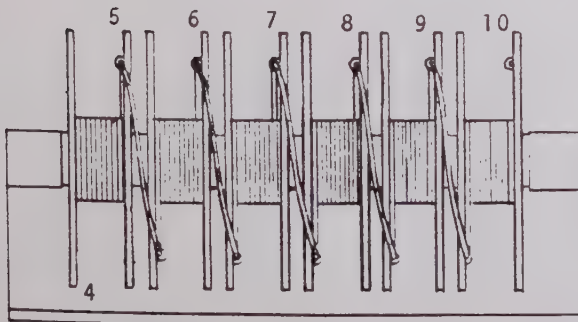
- a. Turn-OFF CB1. Wait 30 seconds.
- b. Connect scope from A3E7 (TP-8) of Switch Regulator A3 to chassis (Figure 6-5).
- c. Turn-ON CB1. Wait for STANDBY light.
- d. Turn-ON HV control and note the 100-120 Hz ripple voltage on switch regulator output on oscilloscope.
- e. Adjust A3R29 on switch regulator A3 for minimum AC ripple components as viewed on oscilloscope.
- f. Turn-OFF high voltage switch.
- g. Turn-OFF CB1. Wait 30 seconds.
- n. Disconnect oscilloscope.

TABLE 6-5

## HIGH VOLTAGE CONNECTION FOR VARIOUS TWT'S

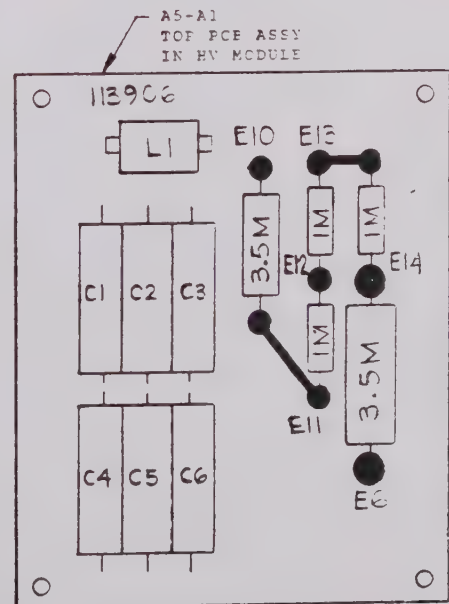
| TWT                                    | A5-T2<br>SECONDARY<br>CONNECTIONS<br>(SEE DETAIL A) |              |              | A5-A1<br>JUMBERS<br>INSTALLED<br>(2)<br>(SEE DETAIL<br>B) | FIELD<br>TIPS<br>POINT<br>SETTING<br>mA | TYPICAL OPERATING CONDITIONS              |               |               |               |               |            | SWITCH<br>REGULATOR<br>TYPICAL OUTPUT<br>-VDC |
|----------------------------------------|-----------------------------------------------------|--------------|--------------|-----------------------------------------------------------|-----------------------------------------|-------------------------------------------|---------------|---------------|---------------|---------------|------------|-----------------------------------------------|
|                                        | VIOLET<br>LEAD                                      | GRAY<br>LEAD | BLUE<br>LEAD |                                                           |                                         | RANGE<br>OF<br>VALUE<br>A5-F53<br>SETTING | HELIX         |               | COLLECTOR     |               |            |                                               |
|                                        |                                                     |              |              |                                                           |                                         |                                           | VOLTAGE<br>KV | CURRENT<br>mA | VOLTAGE<br>KV | CURRENT<br>mA |            |                                               |
| VTU-6295F1<br>VTU-6290F1               | 4 (1)                                               | 10           | 10           | NONE                                                      | 25                                      | LOW<br>HIGH                               | 8.4<br>9.0    | 20<br>20      | 4.2<br>4.51   | 220<br>220    | 165<br>174 |                                               |
| VTH-6272F1                             | 4                                                   | 10           | 10           | NONE                                                      | 25                                      | LOW<br>HIGH                               | 8.7<br>9.3    | 20<br>20      | 4.34<br>4.65  | 350<br>350    | 174<br>188 |                                               |
| VTC-6264F1<br>VTC-6262F1               | 4                                                   | 10           | 9            | NONE                                                      | 25                                      | LOW<br>HIGH                               | 8.2<br>8.6    | 20<br>20      | 4.47<br>4.6   | 300<br>300    | 177<br>189 |                                               |
| VTC-6270F1<br>VTC-6260F1               | 4                                                   | 9            | 7            | E10 TO E12                                                | 25<br>25                                | LOW<br>HIGH                               | 5.0<br>5.6    | 20<br>20      | 3.59<br>4.0   | 240<br>240    | 166<br>166 |                                               |
| VTS-6251F1                             | 4                                                   | 8            | 5            | E10 TO E13                                                | 60                                      | LOW<br>HIGH                               | 3.5<br>4.1    | 60<br>60      | 2.89<br>3.3   | 420<br>420    | 179<br>203 |                                               |
| VTL-6242F1                             | 4                                                   | 9            | 4            | E10 TO E14<br>E10 TO E13                                  | 60                                      | LOW<br>HIGH                               | 3.3<br>3.8    | 60<br>60      | 3.25<br>3.76  | 450<br>450    | 168<br>168 |                                               |
| VTL-6240F1                             | 4                                                   | 8            | 4            | E10 TO E14                                                | 45                                      | LOW<br>HIGH                               | 2.8<br>3.31   | 40<br>40      | 2.8<br>3.3    | 350<br>350    | 168<br>205 |                                               |
| VTC-6231F1                             | 4                                                   | 6            | 6            | E10 TO E13<br>E10 TO E12                                  | 45                                      | LOW<br>HIGH                               | 4.2<br>4.6    | 40<br>40      | 2.89<br>3.1   | 450<br>450    | 176<br>199 |                                               |
| VTS-6250F1                             | 4                                                   | -            | 5            | E10 TO E11<br>AND<br>E6 TO E14<br>E10 TO E13              | 45                                      | LOW<br>HIGH                               | 2.7<br>3.3    | 40<br>40      | 2.06<br>2.52  | 350<br>350    | 166<br>203 |                                               |
| VTC-6260F1<br>VTH-6270F1<br>VTH-6260F1 | 4                                                   | 9            | 6            | E10 TO E13                                                | 15<br>25<br>25                          | LOW<br>HIGH                               | 5.0<br>5.6    | 20<br>20      | 3.3<br>4.1    | 240<br>240    | 170<br>200 |                                               |
| VTM-6294M2                             | 4                                                   | 10           | 10           | NONE                                                      | 25                                      | LOW<br>HIGH                               | 9.0<br>10.0   | 20<br>20      | 4.5<br>5.0    | 270<br>270    | 174<br>193 |                                               |

NOTES: (1) TRANSFORMER TERMINALS  
(2) VALUE OF RESISTANCE IN STRING = 10M - SHORTED PORTION



A5-T2  
HV TRANSFORMER

DETAIL A



DETAIL B

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#### 6.3.4.10 Adjustment of -200V Overvoltage Trip Point

- a. Turn-OFF CB1. Set OPERATE switch to OFF/RESET. Wait 30 seconds.
- b. Remove A3P1 from A3J1 of Switch Regulator PCB (A3)
- c. Connect a jumper from A3-E7 to A3-E10 of switch regulator and a DVM/VOM from A3E7 to chassis.
- d. Turn-ON CB1 and wait for STANDBY light.
- e. Set HV control to OPERATE.
- f. Record voltage on DVM/VOM.
- g. Turn-OFF CB1 and OPERATE switch.
- h. Wait 30 seconds and then replace the jumper between A3-E7 and A3-E10 with a 56K ohm resistor.
- i. Turn-ON CB1 and operate switch. Wait for BEAM ON light.
- j. Adjust A3R53 CW until voltage drops to zero volts DC and logic returns to standby. If the trip point does not occur at  $230 \pm 20$  VDC as the switch regulator output (as read on DVM/VOM) is adjusted upward using A3R53, reset the trip point by adjusting A2R38 on the Osc/Bias PWB.
- k. Adjust A3R53 CCW three full turns.
- l. Turn-OFF CB1. Set OPERATE switch to OFF/RESET. Wait 30 seconds.
- m. Replace the 56K ohm resistor from A3-E7 to A3-E10 with a jumper.
- n. Turn-ON CB1 and OPERATE switch. Wait for BEAM ON light.
- o. Adjust A3R3 to reading recorded in step f.
- p. Turn-OFF CB1, set HV control to OFF/RESET. Wait 30 seconds.
- q. Remove jumper and meter from A3E7 to A3E10.
- r. Reconnect A3P1 to A3J1.

#### 6.3.4.11 Functional Check of Converter Overcurrent Trip Point

- a. Turn-OFF CB1. Wait 30 seconds.
- b. Connect a jumper from the cathode of A4-CR23 to the anode of A40CR23. Preset A4-R18 fully counterclockwise (ccw)

- c. Turn-ON CB1 and wait for STANDBY light.
- d. Set HV control to OPERATE. Turn A4-R18 clockwise (cw). At some point, the fault Indicator on Front Panel will light. A4CR13 will also light.
- e. Turn-OFF CB1. Set HV control to OFF/RESET. Wait 30 seconds. Remove jumper.
- f. Set the voltage across A4C12 as follows:
  - 1. Connect a voltmeter across A4C12.
  - 2. Turn-ON CB1.
  - 3. Adjust A4-R-18 for 5.7 VDC across A4-C12.
- g. Turn-OFF CB1. Wait 30 seconds.
- h. Remove DVM/VOM.

#### 6.3.4.12 Functional Check of Helix Trip Point

- a. Turn-OFF CB1. Wait 30 seconds.
- b. Connect positive lead of DVM to junction of A1R2/A1R3 (wiper). Connect negative lead to chassis.
- c. Turn-ON CB1.
- d. Read and record this voltage. Adjust A1-R3 fully counterclockwise. Wait for the STANDBY light on the Front Panel Indicator.
- e. Set HV voltage control to OPERATE.
- f. The BEAM ON indicator will light momentarily and the Fault light will light. This is a function check of logic drive signals only. Exact adjustment and check of helix trip circuit requires a special dummy load that can handle up to 1500 Watts.
- g. Adjust A1-R3 back to the voltage previously recorded.
- h. If field adjustment of A1-R3 is required and a dummy load is not available, adjust R3 in accordance with the following values. Refer to Table 6-5 for Helix trip points for your particular PA.

| <u>Helix Trip Current (mA)</u><br><u>(approximate)</u> | <u>Ref. Voltage (VDC)</u><br><u>(approximate)</u> |
|--------------------------------------------------------|---------------------------------------------------|
|--------------------------------------------------------|---------------------------------------------------|

|    |     |
|----|-----|
| 15 | 1.5 |
| 25 | 2.5 |
| 45 | 4.5 |
| 60 | 6.0 |

- i. Turn-OFF CB1. Set HV control to OFF/RESET. Wait 30 seconds.
- j. Remove DVM/VOM.
- k. This completes this functional check.

#### 6.3.4.13 Adjust VSWR Trip Point (Option M)

- a. Turn-OFF CB1.
- b. Set up equipment to measure RF output using an RF dummy load capable of dissipating 450W CW (see Section 6.4). Set the frequency to the center of band.
- c. Turn-ON CB1 and wait for STANDBY light.
- d. Set HV control to OPERATE and monitor RF output.
- e. Adjust the RF output until it is 10% of the rated output power for the PA under test. Do not increase RF drive above this point anytime during the procedure
- f. Set HV control to OFF/RESET.
- g. Remove the RF dummy load and place an RF short at the output port of the PA. Keep the RF drive at the level set at step e.
- n. Set HV control to OPERATE.
- i. Adjust A1-R6 for VSWR trip at the RF power level set in step e.
- j. Check the adjustment at both ends of the specified frequency range. The trip point should fall within 5% to 20% of rated output power.



k. This completes this procedure.

NOTE

This completes the routine adjustment procedure. Section 6.6 describes alternative procedures to handle special situations.

6.3.4.14 Heater Surge Current Limit Jumper Selection To increase the heater surge current limit from 5 to 8 amperes, jumper A-3 (Figure 6-6) must be used on the following units:

VTG-6232F1  
VTS-6250F1  
VTS-6252F1

#### 6.4 RF PERFORMANCE CHECK

Refer to Table 6-1 for test equipment required. Equipment with equivalent accuracies or capacities may be substituted for testing purposes; select all equipment for the proper frequency band.

1. Set up a microwave measurement circuit, such as the one shown in Figure 6-10.
2. Set the output of the microwave signal source to a minimum using the input variable attenuator.
3. Calculate the input microwave power needed to produce the saturated output power listed on the data sheet, taking into account the actual TWTA gain shown on the data sheet. This should be done using data from the closest frequency to the desired operating frequency. The actual input power applied to the unit should never be more than 6 dB greater than the calculated value required for saturated power output.

|                                    |                 |
|------------------------------------|-----------------|
| Actual RF Output (from data sheet) | +53.5 dBm       |
| Actual RF Gain (from data sheet)   | <u>38.2 dBm</u> |
| RF Input (For saturated Power)     | +15.3 dBm       |
| Maximum RF Input (+6 dB)           | +21.3 dBm       |

4. Apply AC line voltage to the system.



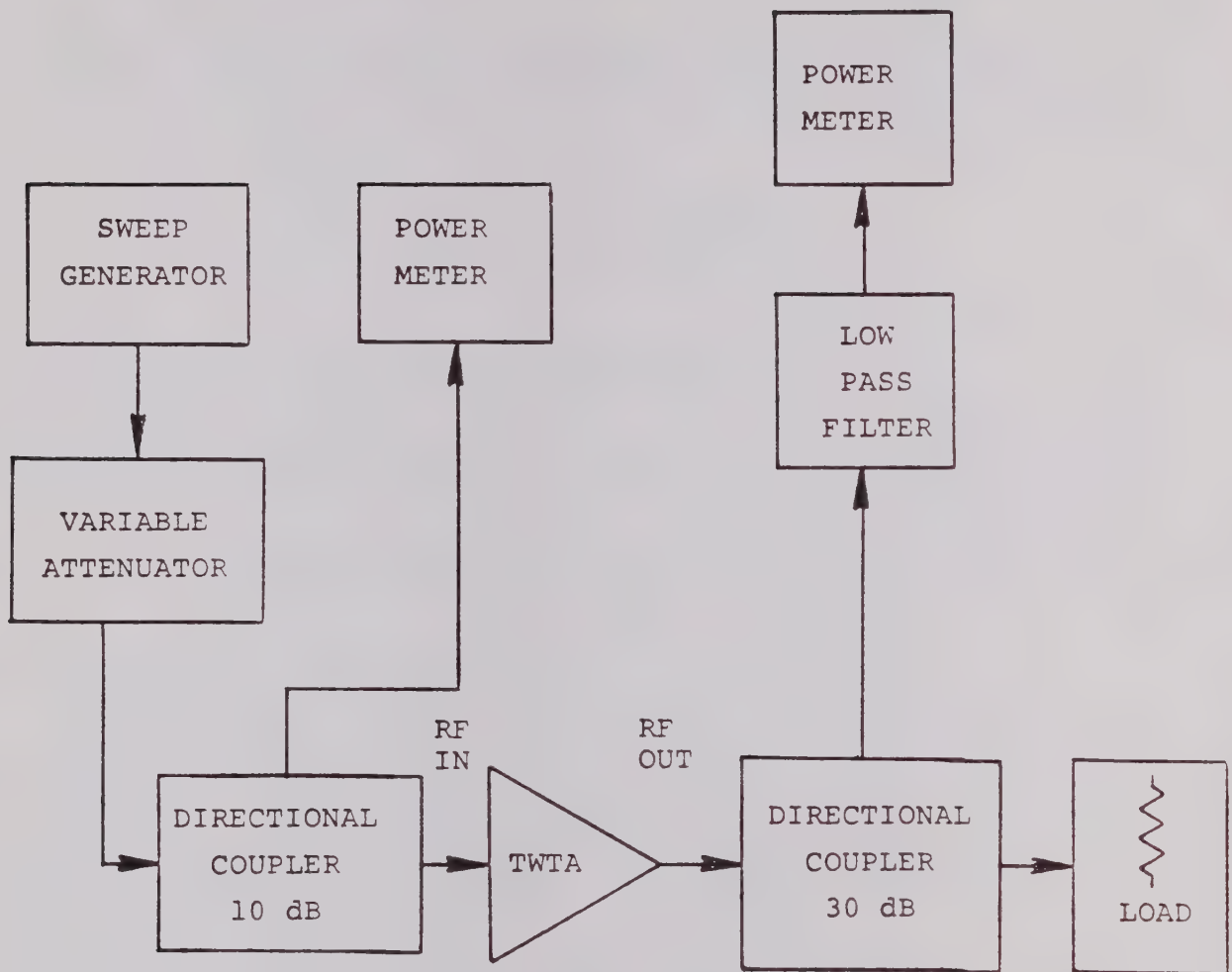


FIGURE 6-10 MICROWAVE MEASUREMENTS CIRCUIT

0933-8/84



### 6.5.1 General

The PA has been designed to facilitate rapid and easy maintenance. In addition to the indicators on the Front Panel, three internal LEDs have been installed as follows:

- a. Two LEDs on the Oscillator Bias PWB (A2) Indicator Switch Regulator Overvoltage (A2-CR12) and Undervoltage A2CR26.
- b. One LED on the HV Converter PWB A4 indicating HV overcurrent condition (A4-CR13).

The PA is shipped with a set of extension cables that can be used for maintenance. PWBs A2, A3 and A4 are designed to mount in extended position for ease of access during maintenance.

NOTE

Limit operation of the A2, A3 and A4 boards to 1/2 hour when in the extended position or they will overheat.

The Logic Board (A1) is designed with slots that mate with the lower mounting screws. The lower mounting screws are adjusted at the factory for a friction fit (Figure 6-11).

```


 CAUTION

Do not disturb the lower mounting bolts of the A1
Board. They do not have to be changed or loosened
to remove the logic board.


```

The upper bolts of the logic board are removed, the board is slipped out and then the upper bolts are used to fasten the slotted end of the board for maintenance access.

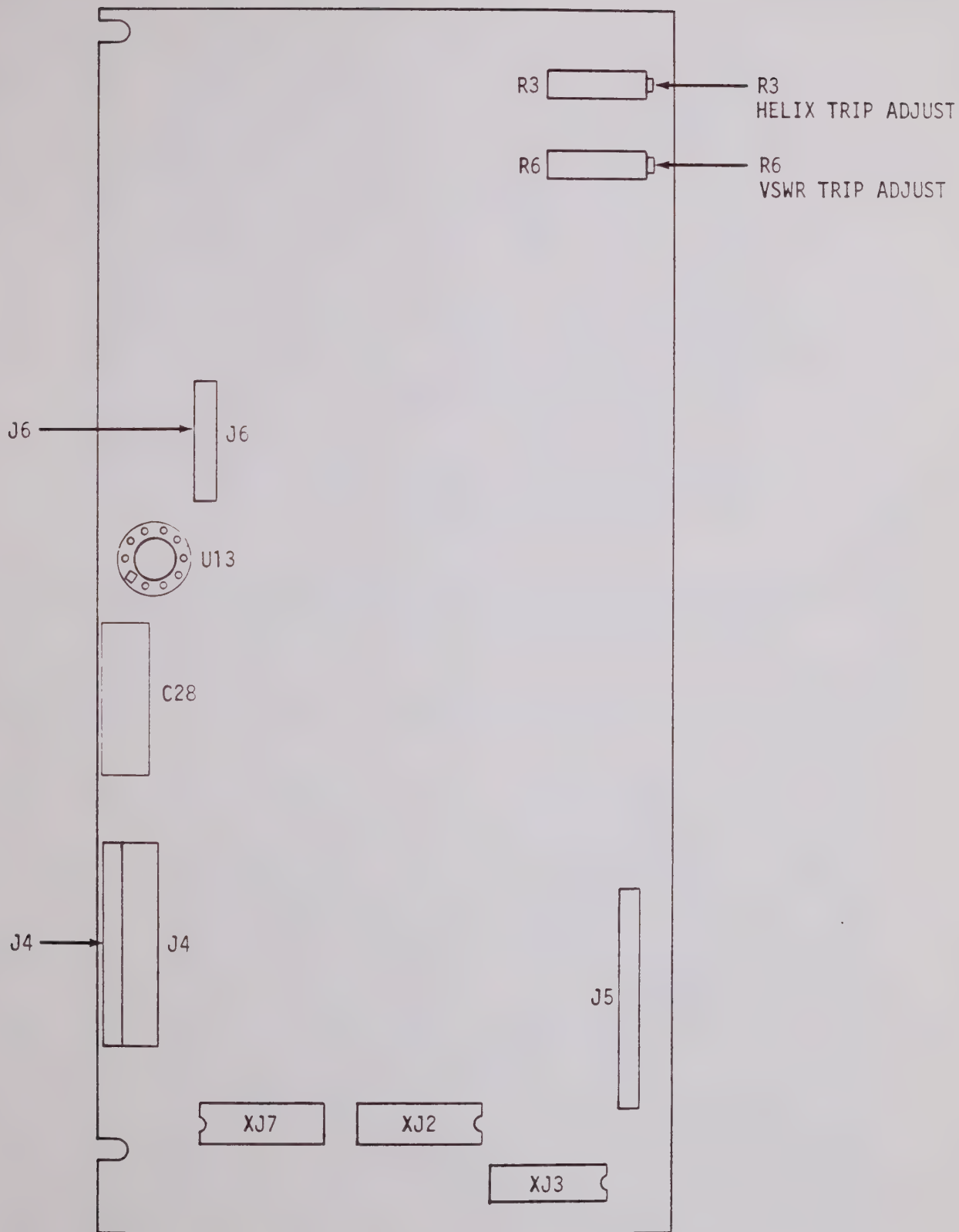


FIGURE 6-11 LOGIC CARD (A1)

0934-8/84

### NOTE

This PA is equipped with fast response fault detection circuits. If you "flip" the OPERATE/OFF/RESET switch from ON-to-OFF and back on again, you may induce faults that would mislead you in servicing the unit. When you turn HV OFF, wait one second to allow the charge in the switch regulator output capacitors to be dissipated then turn the HV ON again. If there is a converter overcurrent fault indication after a very short prime power interruption, this is normal. Both the Fault and Power Supply Indicators will momentarily light and then be automatically cleared by the Fault Recycle Circuits.

#### 6.5.2 Preliminary Check of HV Converter and HV Module (Figure 6-6)

This section will isolate problems in the HV Converter or HV Module.

- a. Turn-OFF CB1. Set HV Control to OFF/RESET. Wait 30 seconds.
- b. Remove A4-P1, Figure 6-6, from A4J1-1 and remove A4-P3 from A4-J3 of HV Converter A4.
- c. Connect jumper from A4J1-6 to chassis. (Helix fault defeat).
- d. Connect jumper from A4J3-1 to chassis. (Switch regulator reference).

- e. Obtain external power supply or other voltage source capable of 200 mA current and any voltage output up to a maximum voltage of 200 VDC.
- f. Connect the negative lead of the voltage source to A4J1-2 of the HV Converter A4 (Figure 6-6).
- g. Connect the positive lead of the voltage source to A4J1-5 of HV Converter A4, Figure 6-6.
- n. Connect oscilloscope from A4-TP-9 (or A4-J3-8) to chassis.
- i. Connect jumper from A3-E7 (TP-8) to A3-E10 of Switch Regulator A3 to prevent the 200V overvoltage circuit from being energized when the Switch Regulator is operated at a no-load condition.

```

* *
* ***** *
* WARNING *
* ***** *
* *
* APPLICATION OF 200 VDC TO THE HIGH VOLTAGE MODULE *
* IN A NO-LOAD CONDITION WILL GENERATE A 15 KV OUTPUT. *
* EXTREME CAUTION IS REQUIRED TO AVOID PERSONNEL *
* INJURY. *
* *
* ***** *
* *

```

- j. Turn-ON CBI. Wait for STANDBY light and then set HV control switch to OPERATE. Turn-ON external voltage source and set to minimum output. Slowly increase voltage source to a value less than 200 VDC. The 10 KHz ± 1.5 KHz square wave will have a peak amplitude equal to the voltage of the voltage source as seen on the oscilloscope.
- k. Return the voltage source to zero volts DC and turn off HV control switch.
- l. Connect oscilloscope A4-TP-10 (or A4-J3-11). Repeat step j, then go to step m. Normal operation of the HV converter has been verified.



- m. Turn-OFF CBI. Set HV control to OFF/RESET. Wait 30 seconds.
- n. Remove jumpers installed in steps c. and d.
- o. Connect A4-P3 (Figure 6-4) to A4-J3 of HV converter.
- p. Remove A5P1, P2, P3 from A5J1, J2, J3.
- q. Repeat steps e through m, this verifies operation of HV converter and HV module.
- r. Remove external power supply.
- s. This completes this procedure.

### 6.5.3 Additional Troubleshooting Procedures

Additional Troubleshooting procedures for the PA are presented in Table 6-6 in the form of charts that relate the symptoms to an assembly or schematic and define the probable cause. Waveforms for the switch regulator and converter are presented in Section 5 (see Table of Contents for a list of illustrations).

Much information is available in Section 6.3 relating to functional tests and adjustment procedures for the various PCB assemblies. These assist in isolating problems and it is recommended that this section be carefully reviewed when troubleshooting is required.

TABLE 6-6

## TROUBLESHOOTING PROCEDURES

| <u>SYMPTOM<br/>CHECK</u>                     | <u>ASSEMBLY</u>  | <u>SCHEMATIC</u> |                                                                                                                                                                                         |
|----------------------------------------------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. No indicator<br>lighted on<br>front panel | PA               | UD1              | Check input voltage<br>CB1.<br>Check for 45 VDC across C2.<br>Check for 300 VDC across C1.                                                                                              |
|                                              | Osc Bias<br>PWB  | A2               | Check for 29 VAC TP1<br>and TP2 to ground*<br>J4-3 and 5 to ground**                                                                                                                    |
|                                              | Osc Bias<br>PWB  | A2               | Check for 12 VDC TP3 to<br>ground*<br>A2J7-10 to ground**                                                                                                                               |
| 2. No Time<br>Delay                          | Logic PWB        | A1               | Check for +12 VDC TP3<br>to ground*<br>A1J7-10 to ground**                                                                                                                              |
|                                              | Logic PWB        | A1               | Check voltage A1U2-9, +12<br>VDC when time delay over.                                                                                                                                  |
| 3. No Standby                                | Logic PWB        | A1               | In time delay, a fault<br>exists.                                                                                                                                                       |
| 4. No BEAM ON<br>at Switch<br>Command        | PA               | UD1              | Check 1 above, a fault<br>exists.<br>Check C1 (-) negative to<br>ground. Read 300 VDC. If<br>less than 10 VDC, check LED<br>CR12 on Osc Bias PCB (A2).                                  |
|                                              | Converter<br>PWB | A1               | Check for 10 KHz<br>square wave TP1 to ground*<br>A4J2-3 to ground** and<br>A4TP2 to ground*<br>A4J2-5 to ground**<br>Check LED CR13 on A4. If<br>lit, indicates converter<br>overload. |
|                                              | Logic PWB        | A1               | A1J7-13 to ground. Read 12<br>VDC. If less than 1 VDC,<br>indicates 38V or 250V shut<br>down circuit is energized.                                                                      |

TABLE 6-6 (Continuation)

## TROUBLESHOOTING PROCEDURES

| <u>SYMPTOM</u>                                      | <u>ASSEMBLY</u>     | <u>SCHEMATIC</u> | <u>CHECK</u>                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------|---------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. Fault                                            | Osc Bias<br>PWB     | A2               | Check LEDS CR12, CR26.                                                                                                                                                                                                                                                                                                                                                            |
|                                                     | Converter<br>PWB    | A4               | Check LED CR13.                                                                                                                                                                                                                                                                                                                                                                   |
|                                                     | Control<br>Logic    | A1               | Determine particular fault by checking for a low voltage less than 1 VDC on the following<br>U1-6 summary fault from power supply<br>U-12 TWT temperature<br>U4-14 Remote Interlock<br>U4-12 Cover Interlock<br>U9-6 Reflected fault<br>U4-7 Helix fault<br>U10-5 Low line inhibit                                                                                                |
| 6. Helix Current<br>Disconnect TWT from HV<br>Fault |                     | PA               | UD1<br><br>module. Check helix current trip point adjust.                                                                                                                                                                                                                                                                                                                         |
| 7. Converter<br>Overload<br>Fault                   | Converter<br>PWB    | A4               | LED CR13 lit, check for TWT failure or HV module failure.                                                                                                                                                                                                                                                                                                                         |
| 8. 250V Over-<br>voltage<br>Shutdown                | Osc Bias<br>PWB     | A2               | LED CR12 lighted.                                                                                                                                                                                                                                                                                                                                                                 |
|                                                     | Switch<br>Regulator | A3               | Check load on switch regulator. If HV module is disconnected, E7 and E10 on switch regulator must be jumpered before switch regulator will turn on at NO LOAD condition without tripping overvoltage protection circuit. Turn-OFF CB1. Connect VOM across C1(+) and C1(-). Turn-ON CB1. If voltage comes on and then falls to zero, check Q6 or Q7 on switch regulator for short. |

TABLE 6-6 (Continuation)  
TROUBLESHOOTING PROCEDURES

| <u>SYMPTOM</u>                       | <u>ASSEMBLY</u>     | <u>SCHEMATIC</u> | <u>CHECK</u>                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9. Undervoltage Osc Bias<br>Snutdown |                     | A2               | LED CR26 lighted.<br>Check output of switch<br>regulator PCB for<br>short circuit or<br>misajdustment of R5 on<br>switch regulator PCB.                                                                                                                                                                                                                      |
|                                      | Switch<br>Regulator | A3               | Check adjustment of<br>current limit<br>circuit. See manual<br>for adjustment<br>procedure.                                                                                                                                                                                                                                                                  |
| 10. Filament<br>Voltage              | HV Module           | A5               | Check for 6.3 VDC from<br>A1E10 to A2E10.                                                                                                                                                                                                                                                                                                                    |
| 11. No RF<br>Output                  | PA                  | UD1              | Check the fittings for<br>a tight connection.<br>Check for voltages<br>applied to the TWT.<br>Check to see that the<br>RF variable attenuator<br>is adjusted fully<br>clockwise.<br>Check the load VSWR.<br>Check the termination<br>in the output and<br>input isolators for<br>discoloration<br>indicating excessive<br>power or VSWRs.<br>Change the TWT. |

## 6.6

## ALTERNATIVE ADJUSTMENT PROCEDURES

The following procedures allow the heater, helix, and collector voltages to be adjusted when a Varian H.V. Monitor is not available.

```


WARNING

THE FOLLOWING PROCEDURES INVOLVE A HIGHER POTENTIAL
HAZARD TO PERSONNEL THAN THOSE IN SECTION 6.3.4.
VARIAN STRONGLY RECOMMENDS THE USE OF THE VARIAN
H.V. MONITOR IF AT ALL POSSIBLE.

```

### 6.6.1 Alternate Method-High Voltage Module A5 No-Load Check When High Voltage Monitor Not Available

Refer to the Test Data Package for specific No-Load Voltages. Use this procedure when TWT has not been changed. Proceed as follows:

- a. Turn-OFF CB1. Set HV Control to OFF/RESET. Wait 30 seconds.
- b. Connect DVM to A3E7 (TP-8) of Switch Regulator A3 and chassis (Figure 6-5). Remove A5P1, P2 and P3 from A5J1, J2, J3.
- c. Defeat interlock switches. Turn-ON CB1 and wait for STANDBY condition.

- d. Set HV Control to OPERATE and read voltage on Switch Regulator output. Adjust A3-R53 to obtain Switch Regulator output corresponding to helix-to-cathode no-load voltage given in Test Data Package. The helix-to-cathode voltage will not be +1% of the voltage recorded on the Test Data Package for no-load conditions.

#### NOTE

This procedure applies if the HV Module involved is the one originally supplied with your PA or a replacement unit with same tap arrangement.

- e. Turn-OFF CB1. Set HV Control to OFF/RESET. Wait 30 seconds.
- f. Remove DVM and reinstall A5P1, P2 and P3 in A5J1, J2, J3.

#### 6.6.2 Alternate Method-High Voltage Module A5 Full-Load Check With No High Voltage Monitor Available

Refer to the Test Data Package for specific full-load voltages. Use this procedure when TWT has not been changed. Proceed as follows:

Repeat steps 6.6.1a through f. eliminating the portion of the procedure involving A5P1, P2 and P3 and using the full-load voltages given in the Test Data Package.

#### 6.6.3 Alternate Method-Heater Voltage Measurement

If no H.V. Monitor is available, the following procedure can be used to measure heater voltage:



\*\*\*\*\*  
 WARNING  
 \*\*\*\*\*

THIS IS A POTENTIALLY RISKY PROCEDURE IF THE HV IS  
 TURNED ON FOR ANY REASON. DO NOT TURN ON THE H.V.  
 TAPE THE H.V. CONTROL IN THE OFF/RESET POSITION.

BE CAREFUL TO AVOID CONTACT WITH THE RFI FILTER  
 ADJACENT TO THE H.V. MODULE BECAUSE IT IS LIVE  
 WITH LINE VOLTAGE POTENTIAL OF 120 OR 230 VAC  
 WHENEVER THE PA IS CONNECTED TO THE PRIME POWER  
 DISTRIBUTION SYSTEM.

\*\*\*\*\*

- a. Turn-OFF CB1. Set HV Control to OFF/RESET and tape in place. Wait 30 seconds.
- b. Remove A4P1 from A4J1 on input converter PCB A4 (Figure 6-6). This prevents the HV from accidentally being applied while measuring the heater voltage.
- c. Remove cover from HV Module. Locate E1 on PCB #2 (A5A2) (Figure 6-10). Connect positive lead of 10 VDC DVM/VOM to A5A2-E1.
- d. Locate E10 on PCB #2 assembly (A5A2), (Figure 6-10). Connect negative lead of DVM/VOM to A5A2-E10.
- e. Press and release the interlock switches.
- f. Turn-ON CB1. The voltmeter will read less than 6.3 VDC. As the timing cycle is completed (approximately three minutes), the voltage will increase to 6.35 VDC  $\pm$  0.1 VDC. If, after the timing cycle is complete and the logic is in STANDBY, the DVM/VOM reads other than 6.35 VDC  $\pm$  0.1 VDC, locate A4R3 on the H.V. Converter PWB A4 (Figure 6-6) and adjust A4R3 to read 6.35 VDC  $\pm$  0.1 VDC on the DVM/VOM.

- #### 6.6.4 Alternate Method-H.V. No-Load Cneck

- a. Turn-OFF CBI. Set HV Control to OFF/RESET. Wait thirty seconds.

- d. Press and release the interlock switches to remove interlock defeat.
- e. Remove the top cover of the HV Module A5 (Figure 6-6).
- f. Connect the High Voltage lead of the HV Divider to A5A1E10 of PWB #1 (A5A1) Figure 6-8.
- g. Connect reference lead of divider to chassis. Connect DVM to the divider output.
- h. Remove A5P1, P2 and P3 from A5J1, J2, J3.
- i. Turn-on CB1.
- j. Defeat the interlock switch by pulling stem out. Wait three minutes. Set HV Control to OPERATE.
- k. Record the voltage measured.

- j. If helix voltage is incorrect, adjust to proper value using A3R53 on the Switch Regulator PWB.
- k. Set HV Control to OFF/RESET.
- l. Turn-off CBI. Wait 30 seconds.
- m. Press and release the interlock switches.
- n. Remove the HV Divider.
- o. Replace the HV Module Cover.
- p. Reinstall A5P1, P3, P3 into A5J1, J2, J3.
- q. This completes the procedure.

#### 6.6.5 Alternate Method-Final Adjustment of Helix Voltage, Collector Voltage

If H.V. Monitor is not available, and TWT has been changed, proceed as follows:

##### NOTE

This procedure is very similar to 6.6.4 with the TWT left connected and the collector voltage, as well as the helix voltage, measured.

- a. Repeat 6.6.4a. through o. except for step f.
- b. Move H.V. Divider to A1E5 with the reference lead connected to chassis., Refer to Table 6-5 for collector voltage for TWT type used in unit.
- c. Turn-ON CBI. Wait three minutes for STANDBY. Set H.V. Control to OPERATE.
- d. Record the measured voltage. This value is the collector-to-helix voltage.

##### NOTE

The collector-to-cathode voltage is equal to the measured helix voltage (6.6.4 i.) minus the value recorded in step d.

- [illegible]

See Section 6.3.4.8 for the procedure involving tap changes.

- 6-55









# SECTION 7

## DRAWINGS AND SCHEMATICS VARIAN 6900g SERIES MPA

| DESIGNATION      | TITLE                           | DRAWING NUMBER |
|------------------|---------------------------------|----------------|
| UD1              | VZM-6993G5 Series Final Assy    | 01008115       |
|                  | VZC-6963G5 Series Final Assy    | 01008116       |
|                  | VZC-6962G5 Series Final Assy    | 01008121       |
|                  | VZS-6953G5 Series Final Assy    | 01008119       |
|                  | VZX-6983G5 Series Final Assy    | 01008122       |
|                  | VZM-6992G6 Series Final Assy    | 01008124       |
|                  | VZL-6943G5 Series Final Assy    | 01008120       |
| UD1              | VZU-6992G5 Series Final Assy    | 01008123       |
| 100/200 Watt TWT | Test Specifiction               | 01008118       |
| Option L         | SSA Option Kit                  | 01004173       |
| Option N         | PIN Diode Option Kit            | 01008031       |
| UD1              | Schematic, RF, Coax Models      | 01008339       |
| UD1              | Schematic, RF, Waveguide Models | 01008117       |
| UD1              | Assembly, 100/200W Power Supply | E113979-10     |
| UD1              | Outline, 100/200W PA            | D113850        |
| UD1              | Schematic, 100/200W PA          | J129820        |
| UD1A1            | Logic PWB Assembly              | D129079        |
| UD1A1            | Schematic, Logic PWB            | E129076        |
| UD1A2            | Oscillator/Bias PWB Assembly    | D113483        |
| UD1A2            | Schematic, Oscillator/Bias PWB  | E113480        |
| UD1A3            | Switch Regulator PWB Assembly   | D01000374      |
| UD1A3            | Schematic, Switch Regulator PWB | E01000371      |
| UD1A4            | HV Converter/Heater Supply      |                |
|                  | PWB Assembly                    | D129405        |

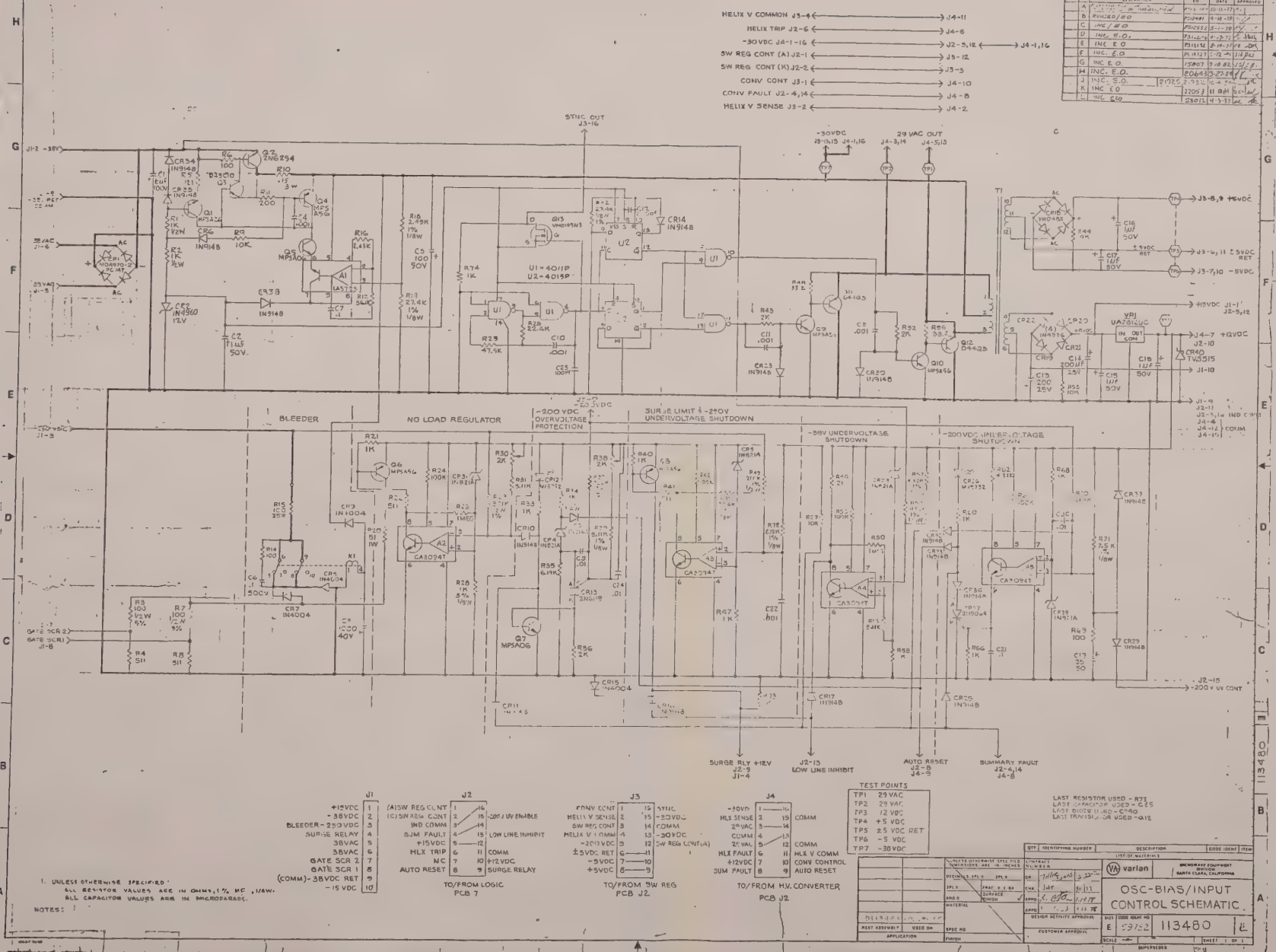
## SECTION 7 (Continuation)

### DRAWINGS AND SCHEMATICS

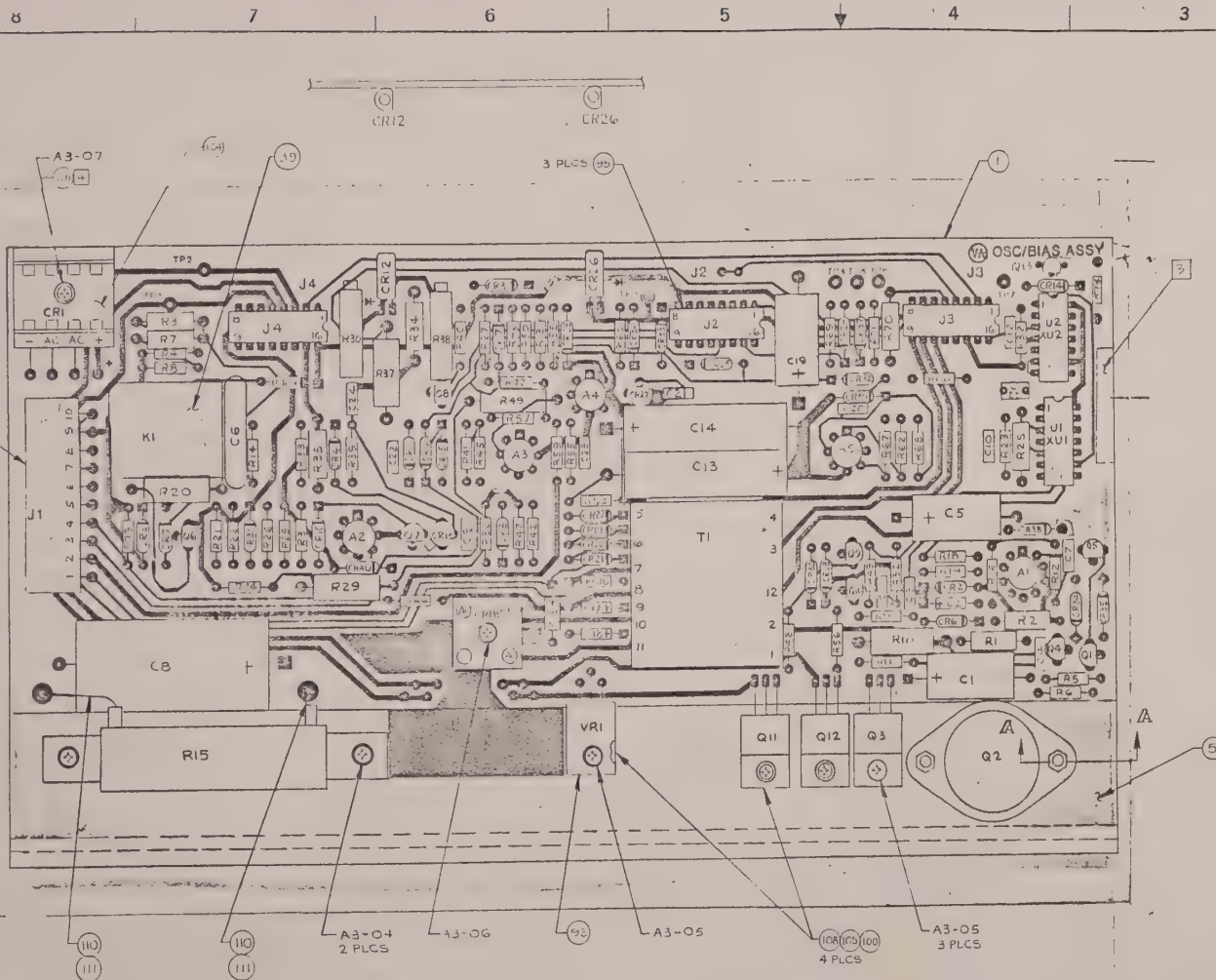
| DESIGNATION | TITLE                          | DRAWING NUMBER |
|-------------|--------------------------------|----------------|
| UD1A4       | Schematic, HV Converter/Heater |                |
|             | Supply PWB                     | D129402        |
| UD1A5       | High Voltage Module Assembly   | D113919        |
| UD1A5       | Schematic, High Voltage Module | D113907        |
| UD1A5A1     | PCB #1 H.V. Module Assembly    | D113906        |
| UD1A5A1     | Schematic, PCB #1 H.V. Module  | See 1A5        |
| UD1A5A2     | PCB #2 H.V. Module Assembly    | D113902        |
| UD1A5A2     | Schematic, PCB #2 H.V. Module  | See 1A5        |
| UD1A8       | Fault/Recycle Board Assembly   | C129083        |
| UD1A8       | Schematic, Fault/Recycle Board | See 1A1        |
| UD1-3       | Front Panel Assembly           | D129054        |

The parts lists for these drawings are separate documents that carry the same drawing number; LM113979 is the material list for drawing E113979.

NOTE: THE DRAWINGS LISTED ABOVE FOLLOW IN NUMERICAL ORDER.







5. CONFORMAL COAT PER 01006342 -01 ONLY

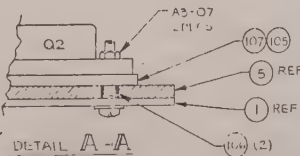
4. INSTALL ITEM 109 BETWEEN HEATSINK AND FLAT WASHER AT SCREW HEAD END

3. MARK WITH CURRENT P/N & REVISION LETTER.

2. ASSEMBLE USING HARDWARE DWS 110625.

1. ASSEMBLE PER VARIAN WORKMANSHIP STD 87-800-279.

NOTES: UNLESS OTHERWISE SPECIFIED



|      |      | REVISIONS   |        |      |          |
|------|------|-------------|--------|------|----------|
| ZONE | ITER | DESCRIPTION | EO     | DATE | APPROVED |
| C    | 1    | REVISED P/N | 1-1-76 |      |          |
| D    | 2    | REVISED P/N | 1-1-76 |      |          |
| E    | 3    | INC E.O.    | 1-1-76 |      |          |
| F    | 4    | INC E.O.    | 1-1-76 |      |          |
| G    | 5    | INC E.O.    | 1-1-76 |      |          |
| H    | 6    | INC E.O.    | 1-1-76 |      |          |
| I    | 7    | INC E.O.    | 1-1-76 |      |          |
| J    | 8    | INC E.O.    | 1-1-76 |      |          |
| K    | 9    | INC E.O.    | 1-1-76 |      |          |
| L    | 10   | INC E.O.    | 1-1-76 |      |          |
| M    | 11   | INC E.O.    | 1-1-76 |      |          |
| N    | 12   | INC E.O.    | 1-1-76 |      |          |
| O    | 13   | INC E.O.    | 1-1-76 |      |          |
| P    | 14   | INC E.O.    | 1-1-76 |      |          |
| Q    | 15   | INC E.O.    | 1-1-76 |      |          |
| R    | 16   | INC E.O.    | 1-1-76 |      |          |
| S    | 17   | INC E.O.    | 1-1-76 |      |          |
| T    | 18   | INC E.O.    | 1-1-76 |      |          |
| U    | 19   | INC E.O.    | 1-1-76 |      |          |
| V    | 20   | INC E.O.    | 1-1-76 |      |          |
| W    | 21   | INC E.O.    | 1-1-76 |      |          |
| X    | 22   | INC E.O.    | 1-1-76 |      |          |
| Y    | 23   | INC E.O.    | 1-1-76 |      |          |
| AA   | 24   | INC E.O.    | 1-1-76 |      |          |
| AB   | 25   | INC E.O.    | 1-1-76 |      |          |
| AC   | 26   | INC E.O.    | 1-1-76 |      |          |

SEE SEPARATE LIST OF MATERIALS LM113483

| QTY                                                 | IDENTIFYING NUMBER | DESCRIPTION                                          | CODE IDENT | ITEM |
|-----------------------------------------------------|--------------------|------------------------------------------------------|------------|------|
| LIST OF MATERIALS                                   |                    |                                                      |            |      |
| CONTRACT NUMBER                                     |                    | VARIAN                                               |            |      |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |                    | MICROWAVE EQUIPMENT DIVISION SANTA CLARA, CALIFORNIA |            |      |
| DECIMALS: 1PL ± 1, 2PL ± 0.2                        |                    | ASSEMBLY                                             |            |      |
| 3PL ± 0.04                                          |                    | OSCILLATOR/BIAS PCB                                  |            |      |
| FRAC ± 1/64                                         |                    | SCALE 2/1 CLASS 1                                    |            |      |
| SURFACE FINISH                                      |                    | SHEET 1 OF 1                                         |            |      |
| AND ± 1"                                            |                    | SUPERSEDES                                           |            |      |
| MATERIAL                                            |                    | DESIGN ACTIVITY APPROVAL                             |            |      |
| C113979                                             |                    | CUSTOMER APPROVAL                                    |            |      |
| 100% TWT                                            |                    | SIZE CODE IDENT NO                                   |            |      |
| NEXT ASSEMBLY USED ON                               |                    | D 59782 113483                                       |            |      |
| SPEC NO                                             |                    | CLASS 1                                              |            |      |
| APPLICATION                                         |                    | SHEET 1 OF 1                                         |            |      |
| FINISH                                              |                    | SUPERSEDES                                           |            |      |









| varian  |          | MICROWAVE EQUIPMENT OPERATIONS     | OSC/BIAS PCB ASSY | LM 113483 |                      | REV             |
|---------|----------|------------------------------------|-------------------|-----------|----------------------|-----------------|
| ITEM NO | REF DES  | DESCRIPTION                        | VARIAN PART NO.   | MFG       | MFG OR MS PART NO.   | QTY/DASH NO.    |
|         |          |                                    |                   |           |                      | -00 -01 -02 -03 |
| 1       |          | FAB. OSC/BIAS PCB                  | 113482            |           |                      | 1 1             |
| 2       |          |                                    |                   |           |                      |                 |
| 3       |          | SCHEMATIC                          | 113480            |           |                      | R R             |
| 4       |          |                                    |                   |           |                      |                 |
| 5       |          | HEATSINK                           | 129026            |           |                      | 1 1             |
| 6       |          |                                    |                   |           |                      |                 |
| 7       | A1       | I.C. - VOLTAGE REGULATOR           | 62-600711         | LAMBDA    | LAS-723              | 1 1             |
| 8       | A2-A5    | I.C. - AMPLIFIER                   | 62-600676         | RCA       | CA3094T              | 4 4             |
| 9       |          |                                    |                   |           |                      |                 |
| 10      | C10      | CAPACITOR, CER., .001 uf, 2%, 200V | 41-119986         |           |                      | 1 1             |
| 11      | C1       | CAPACITOR, ELECT., 10 uf, 100V     | 41-506015         | SPRAGUE   | 500D106F100CB5       | 1 1             |
| 12      | C2,15-18 | CAPACITOR, TANT., 1 uf, 50V        | 41-606802         | SPRAGUE   | CS13BG105K           | 5 5             |
| 13      | C3,4,11, | CAPACITOR, CERAMIC, .001 uf, 200V  | 41-229953         |           | CK05BX102K           | 5 5             |
|         | 22,23    |                                    |                   |           |                      |                 |
| 14      | C5       | CAPACITOR, ELECT., 22 uf, 80V      | 41-516738         | SPRAGUE   | 500D226M080CC5       | 1 1             |
| 15      | C6       | CAPACITOR, CERAMIC, .1 uf, 500V    | 41-256900         | SPRAGUE   | 5GA-P10              | 1 1             |
| 16      | C7,21    | CAPACITOR, CERAMIC, .1 uf, 100V    | 41-229952         |           | CK06BX104K           | 3 3             |
| 17      | C8       | CAPACITOR, ELECT., 100 uf, 40V     | 41-505891         | SIEMENS   | B41010-1000/40/82000 | 1 1             |
| 18      | C9,24    | CAPACITOR, CERAMIC, .01 uf, 200V   | 41-229951         |           |                      | 2 2             |
| 19      | C12      | CAPACITOR, CERAMIC, 200 pf, 200V   | 41-229965         |           | CK05BX221K           | 1 1             |
| 20      | C13,14   | CAPACITOR, ELECT., 220 uf, 63V     | 41-516741         | SPRAGUE   | 500D227M063DM2       | 2 2             |



| varian  |           | MICROWAVE EQUIPMENT OPERATIONS   |  | OSC/BIAS PCB ASSY |          | LM 113483          |              | REV AC |         |
|---------|-----------|----------------------------------|--|-------------------|----------|--------------------|--------------|--------|---------|
| ITEM NO | REF DES   | DESCRIPTION                      |  | VARIAN PART NO.   | MFG      | MFG OR MS PART NO. | QTY/DASH NO. |        |         |
|         |           |                                  |  |                   |          |                    | -00          | -01    | -02 -03 |
| 21      | C19       | CAPACITOR, ELECT., 47 uf, 80V    |  | 41-516744-00      | SPRAGUE  | 500D476M080DC2     | 1            | 1      |         |
| 22      | C20       | CAPACITOR, CERAMIC, .01 uf, 200V |  | 41-229951         |          | CK06BX103K         | 1            | 1      |         |
| 23      | C25       | CAPACITOR, CERAMIC, 100 pf, 200V |  | 41-229960         |          | CK05BX101K         | 1            | 1      |         |
| 24      |           |                                  |  |                   |          |                    |              |        |         |
| 25      | CR1       | DIODE, BRIDGE                    |  | 66-230613         | MOTOROLA | MDA970-2           | 1            | 1      |         |
| 26      | CR2       | DIODE, ZENER, 12V                |  | 66-304960         | UNITRODE | 1N4960             | 1            | 1      |         |
| 27      | CR3,6,10, | DIODE, SIGNAL                    |  | 66-320914         |          | 1N914B             | 18           | 18     |         |
|         | 11,14,16, |                                  |  |                   |          |                    |              |        |         |
|         | 17,25,28- |                                  |  |                   |          |                    |              |        |         |
|         | 30,32-38  |                                  |  |                   |          |                    |              |        |         |
| 28      | CR4,8,23, | DIODE                            |  | 66-310821         |          | 1N821A             | 5            | 5      |         |
|         | 31,39     |                                  |  |                   |          |                    |              |        |         |
| 29      | CR5,7,    | DIODE, RECTIFIER                 |  | 66-304004         |          | 1N4004             | 4            | 4      |         |
|         | 9,15      |                                  |  |                   |          |                    |              |        |         |
| 30      | CR12,26   | DIODE, LED-RED                   |  | 67-499834         | MONSANTO | MV5752             | 2            | 2      |         |
| 31      | CR13      | UNIJUNCTION                      |  | 62-906119         |          | 2N6119             | 1            | 1      |         |
| 32      | CR18      | DIODE, BRIDGE                    |  | 66-235014         | VARO     | VH-048X            | 1            | 1      |         |
| 33      | CR19-22   | DIODE, RECTIFIER                 |  | 66-304936         |          | 1N4936             | 4            | 4      |         |
| 34      | CR27      | DIODE, SCR                       |  | 66-600088         |          | 2N5064             | 1            | 1      |         |
| 35      | CR40      | DIODE, TRANSIENT SUPPRESSOR      |  | 55-400031         | UNITORDE | TVS515             | 1            | 1      |         |
| 36      |           |                                  |  |                   |          |                    |              |        |         |





| varian  |            | MICROWAVE EQUIPMENT OPERATIONS    |  | OSC/BIAS PCB ASSY |                  | LM 113483         |  | REV AC       |             |
|---------|------------|-----------------------------------|--|-------------------|------------------|-------------------|--|--------------|-------------|
| ITEM NO | REF DES    | DESCRIPTION                       |  | VARIAN PART NO    | MFG              | MFG OR MS PART NO |  | QTY. DASH NO |             |
|         |            |                                   |  |                   |                  |                   |  | -00          | -01 -02 -03 |
| 37      | J1         | CONNECTOR, 10 PIN                 |  | 51-407160         | MOLEX            | 09-75-1101        |  | 1            | 1           |
| 38      |            |                                   |  |                   |                  |                   |  |              |             |
| 39      | K1         | RELAY                             |  | 72-115933         | POTTER&BRUMFIELD | R10E2-Y2-J2,5K    |  | 1            | 1           |
| 40      |            |                                   |  |                   |                  |                   |  |              |             |
| 41      |            |                                   |  |                   |                  |                   |  |              |             |
| 42      | Q1,5,7     | TRANSISTOR, NPN                   |  | 62-920018         | MOTOROLA         | MPS A06           |  | 3            | 3           |
| 43      | Q2         | TRANSISTOR, NPN                   |  | 62-906254         | RCA              | 2N6254            |  | 1            | 1           |
| 44      | Q3         | TRANSISTOR, PNP                   |  | 62-798021         | GE               | D45C10            |  | 1            | 1           |
| 45      | Q4,6,8-10  | TRANSISTOR, PNP                   |  | 62-920019         | MOTOROLA         | MPS A56           |  | 5            | 5           |
| 46      | Q11,12     | TRANSISTOR, NPN                   |  | 62-798003         | GE               | D44H11            |  | 2            | 2           |
| 47      | Q13        | TRANSISTOR, FET                   |  | 62-798135         | STX              | VN0109N3          |  | 1            | 1           |
| 48      |            |                                   |  |                   |                  |                   |  |              |             |
| 49      |            |                                   |  |                   |                  |                   |  |              |             |
| 50      | R1,R2      | RESISTOR, COMP, 1K, 1/2W, 5%      |  | 32-201410         |                  | RC20GF102J        |  | 2            | 2           |
| 51      | R3,7       | RESISTOR, COMP, 100 OHM, 1/2W, 5% |  | 32-201310         |                  | RC20GF101J        |  | 2            | 2           |
| 52      | R4,8,22,41 | RESISTOR, M.F., 511 OHM, 1/4W, 1% |  | 31-102185         |                  |                   |  | 4            | 4           |
| 53      | R5         | RESISTOR, M.F., 121 OHM, 1/4W, 1% |  | 31-102125         |                  |                   |  | 1            | 1           |
| 54      | R6,14,69   | RESISTOR, M.F., 100 OHM, 1/4W, 1% |  | 31-102117         |                  |                   |  | 3            | 3           |
| 55      | R9         | RESISTOR, M.F., 10K, 1/4W, 1%     |  | 31-102309         |                  |                   |  | 1            | 1           |
| 56      | R10        | RESISTOR, W.W., .15 OHM, 3W, 3%   |  | 31-599708         | DALE             | RS-2B             |  | 1            | 1           |



| varian  |              | MICROWAVE EQUIPMENT OPERATIONS    |  | OSC/BIAS PCB ASSY |        |                   | LM 113483     |     | REV AC |     |
|---------|--------------|-----------------------------------|--|-------------------|--------|-------------------|---------------|-----|--------|-----|
| ITEM NO | REF DES      | DESCRIPTION                       |  | VARIAN PART NO    | MFG    | MFG OR MS PART NO | QTY. DASH NO. |     |        |     |
|         |              |                                   |  |                   |        |                   | -00           | -01 | -02    | -03 |
| 57      | R11          | RESISTOR, M.F., 200 OHM, 1/4W, 1% |  | 31-102146         |        |                   |               | 1   | 1      |     |
| 58      | R12          | RESISTOR, M.F., 56.1K, 1/4W, 1%   |  | 31-102381         |        |                   |               | 1   | 1      |     |
| 59      | R13          | RESISTOR, M.F., 5.11K, 1/4W, 1%   |  | 31-102281         |        |                   |               | 1   | 1      |     |
| 60      | R15          | RESISTOR, W.W., 100 OHM, 25W, 5%  |  | 35-497310         | OHMITE | 0200F             |               | 1   | 1      |     |
| 61      | R16          | RESISTOR, M.F., 2.43K, 1/4W, 1%   |  | 31-102250         |        |                   |               | 1   | 1      |     |
| 62      | R71          | RESISTOR, M.F., 7.5K, 1/8W, 1%    |  | 31-604750         | DALE   | RN60C             |               | 1   | 1      |     |
| 63      | R18          | RESISTOR, M.F., 2.49K, 1/8W, 1%   |  | 31-610088         | DALE   | MF-1/10-T2        |               | 1   | 1      |     |
| 64      | R19          | RESISTOR, M.F., 27.4K, 1/8W, 1%   |  | 31-610201         |        | RNR552742FP       |               | 1   | 1      |     |
| 65      | R20          | RESISTOR, COMP, 51 OHM, 1W, 5%    |  | 33-301251         |        | RC32GF510J        |               | 1   | 1      |     |
| 66      | R21, 33, 40, | RESISTOR, M.F., 1K, 1/4W, 1%      |  | 31-102213         |        |                   |               | 1   | 1      |     |
|         | 47, 28, 58   |                                   |  |                   |        |                   |               |     |        |     |
|         | 60, 66, 68,  |                                   |  |                   |        |                   |               |     |        |     |
|         | 73, 74       |                                   |  |                   |        |                   |               |     |        |     |
| 67      | R23          | RESISTOR, M.F., 47.5K, 1/4W, 1%   |  | 31-102374         |        |                   |               | 1   | 1      |     |
| 68      | R24, 42,     | RESISTOR, M.F., 100K, 1/4W, 1%    |  | 31-102405         |        |                   |               | 4   | 4      |     |
|         | 55, 67       |                                   |  |                   |        |                   |               |     |        |     |
| 69      | R25          | RESISTOR, M.F., 22.6K, 1/4W, 1%   |  | 31-102343         |        | RN60C             |               | 1   | 1      |     |
| 70      | R26, 50      | RESISTOR, M.F., 1 MEG, 1/4W, 1%   |  | 31-102501         |        |                   |               | 2   | 2      |     |
| 71      | R27, 44, 53  | RESISTOR, M.F., 10K, 1/4W, 1%     |  | 31-102309         |        |                   |               | 3   | 3      |     |
| 72      | R45          | RESISTOR, M.F., 22.6K, 1/8W, 1%   |  | 31-610092         | DALE   | MF-1/10-T2        |               | 1   | 1      |     |
| 73      | R29          | RESISTOR, M.F., 301K, 1/2W, 1%    |  | 31-610101         |        | RN65C3013F        |               | 1   | 1      |     |



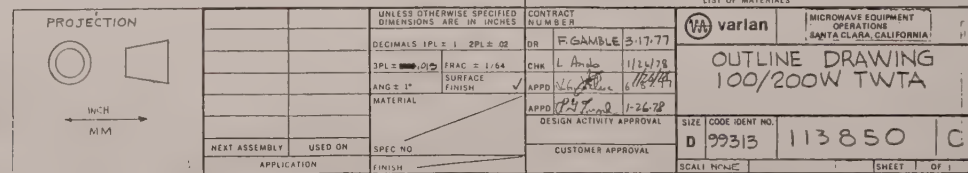
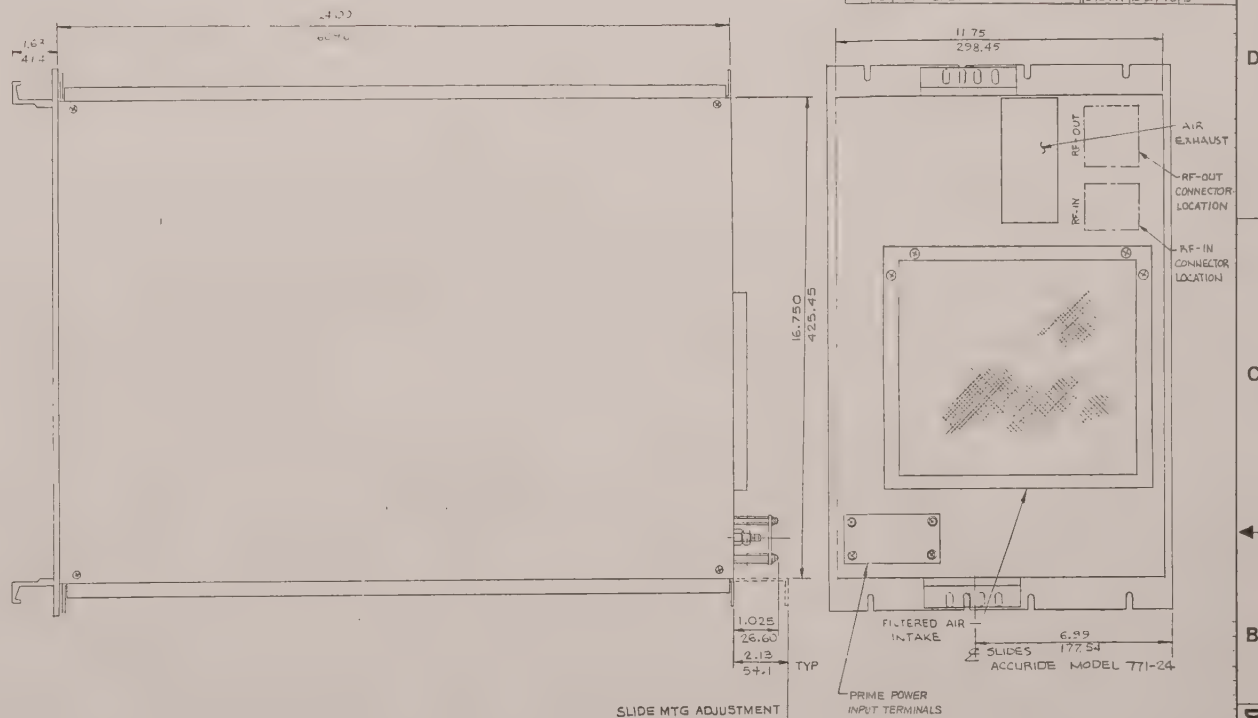
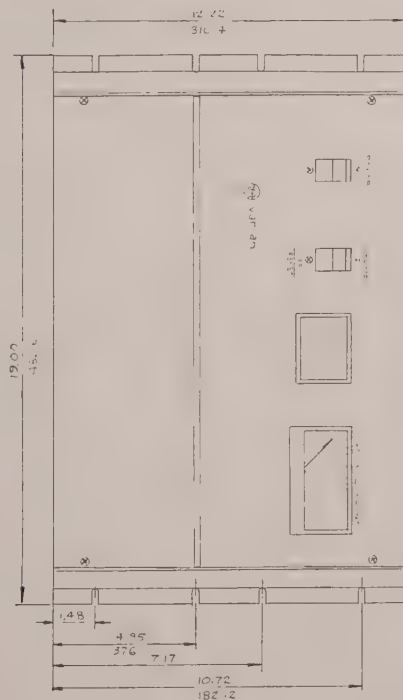
| varian  |         | MICROWAVE EQUIPMENT OPERATIONS     |                | OSC/BIAS PCB ASSY |                   | LM 113483    |    | REV AC |      |  |
|---------|---------|------------------------------------|----------------|-------------------|-------------------|--------------|----|--------|------|--|
| ITEM NO | REF DES | DESCRIPTION                        | VARIAN PART NO | MFG               | MFG OR MS PART NO | QTY. JASH NO |    |        |      |  |
|         |         |                                    |                |                   |                   | - 00         | 01 | - 02   | - 03 |  |
| 74      | R30,38  | RESISTOR, VARIABLE, 2K, 3/4W, 10%  | 36-792211      | BOURNS            | 3006P-1-202       | 2            | 2  |        |      |  |
| 75      | R31,39  | RESISTOR, M.F., 5.11K, 1/8W, 1%    | 31-610050      | DALE              | MF-1/10-T2        | 2            | 2  |        |      |  |
| 76      | R32     | RESISTOR, M.F., 29.4K, 1/4W, 1%    | 31-102354      | DALE              | MF-1/10-T2        | 1            | 1  |        |      |  |
| 77      | R34     | RESISTOR, M.F., 1K, 1/4W, 1%       | 31-102213      |                   | RN60C             | 1            | 1  |        |      |  |
| 78      | R35,R72 | RESISTOR, M.F., 6.19K, 1/4W, 1%    | 31-102289      |                   | RN60C             | 2            | 2  |        |      |  |
| 79      | R36,43, | RESISTOR, M.F., 2K, 1/4W, 1%       | 31-102242      |                   |                   | 4            | 4  |        |      |  |
|         | 46,52   |                                    |                |                   |                   |              |    |        |      |  |
| 80      | R37     | RESISTOR, M.F., 226K, 1/2W, 1%     | 31-610103      |                   | RN65C2263F        | 1            | 1  |        |      |  |
| 81      | R48,56  | RESISTOR, M.F., 33.2 OHM, 1/4W, 1% | 31-102071      |                   |                   | 2            | 2  |        |      |  |
| 82      | R49     | RESISTOR, M.F., 200K, 1/2W, 1%     | 31-614804      | DALE              | MMF-1/4-T2        | 1            | 1  |        |      |  |
| 83      | R59     | RESISTOR, M.F., 24.3K, 1/8W, 1%    | 31-610090      | DALE              | MF-1/10-T2        | 1            | 1  |        |      |  |
| 84      | R62     | RESISTOR, M.F., 4.32K, 1/4W, 1%    | 31-102274      |                   |                   | 1            | 1  |        |      |  |
| 85      | R70     | RESISTOR, M.F., 143K, 1/4W, 1%     | 31-102420      |                   | RN60C             | 1            | 1  |        |      |  |
| 86      | R57     | RESISTOR, M.F., 4.42K, 1/4W, 1%    | 31-102275      |                   | RN60C             | 1            | 1  |        |      |  |
| 87      |         |                                    |                |                   |                   |              |    |        |      |  |
| 88      | T1      | TRANSFORMER                        | 113997         |                   |                   | 1            | 1  |        |      |  |
| 89      |         |                                    |                |                   |                   |              |    |        |      |  |
| 90      | U1      | I.C. - QUAD 2 - INPUT NAND         | 62-600728      | FAIRCHILD         | 4011P             | 1            | 1  |        |      |  |
| 91      | U2      | I.C. - FLIP FLOP                   | 62-600729      | FAIRCHILD         | 4013P             | 1            | 1  |        |      |  |
| 92      |         |                                    |                |                   |                   |              |    |        |      |  |
| 93      | VR1     | VOLTAGE REGULATOR +12V             | 62-600495      | FAIRCHILD         | 7812UC            | 1            | 1  |        |      |  |





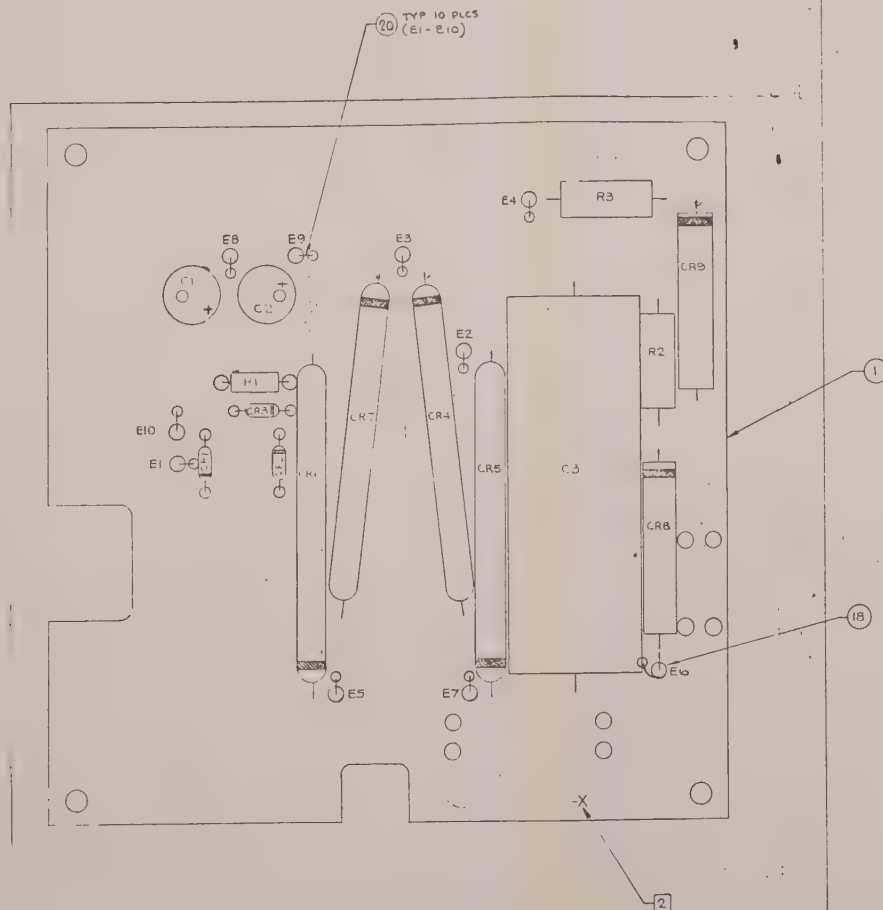
| varian  |          | MICROWAVE EQUIPMENT<br>OPERATIONS    | OSC/BIAS PCB ASSY |               | LM 113483          | REV<br>AC       |
|---------|----------|--------------------------------------|-------------------|---------------|--------------------|-----------------|
| ITEM NO | REF DES  | DESCRIPTION                          | VARIAN PART NO.   | MFG           | MFG OR MS PART NO. | QTY/DASH NO.    |
|         |          |                                      |                   |               |                    | -00 -01 -02 -03 |
| 94      |          |                                      |                   |               |                    |                 |
| 95      | XJ2-J4   | SOCKET, I.C., 16 PIN                 | 54-634023         | CIRCUIT ASSY  | CA-16S-10SD        | 3 3             |
| 96      |          |                                      |                   |               |                    |                 |
| 97      |          |                                      |                   |               |                    |                 |
| 98      |          |                                      |                   |               |                    |                 |
| 99      | XU1, XU2 | SOCKET, I.C., 14 PIN                 | 54-910403         | AMP           | 640357-3           | 2 -             |
| 100     |          | WASHER, SHOULDER                     | 14-998043         | SEASTROM      | 5607-45            | 4 4             |
| 101     |          |                                      |                   |               |                    |                 |
| 102     |          |                                      |                   |               |                    |                 |
| 103     |          |                                      |                   |               |                    |                 |
| 104     |          | HEAT SINK                            | 66-899-759        | AHAMTOR       | 370                | 1 1             |
| 105     |          | THERMAL COMPOUND                     | 88-298900         | WAKEFIELD     | 120-8              | AR AR           |
| 106     |          | BUSHING                              | 22-419832         | AMATOM        | 9222-PH-140        | 2 2             |
| 107     |          | INSULATOR, T0-3                      | 62-898002         | UNION CARBIDE | H-4001             | 1 1             |
| 108     |          | INSULATOR, PLASTIC                   | 62-899937         | THERMALLOY    | 43-77-2            | 4 4             |
| 109     |          | WASHER, INTERNAL TOOTH #4            | 14-302004         |               |                    | 1 1             |
| 110     |          | WIRE, UNINSUL., #20 COPPER           | 81-099920         |               |                    | AR AR           |
| 111     |          | TUBING, INSUL, FIBERGLASS-SILICONE   | 88-495071         |               |                    | AR AR           |
| 112     |          | POTTING PROCEDURE HUMISEAL TYPE 1B31 | 01006345          |               |                    | - R             |
|         |          |                                      |                   |               |                    |                 |
|         |          |                                      |                   |               |                    |                 |





| REVISIONS |    |                               |         |          |                    |
|-----------|----|-------------------------------|---------|----------|--------------------|
| ZONE      | TR | DESCRIPTION                   | EO      | DATE     | APPROVED           |
|           | A  | ADDED DIM 2.13 SLICE MFG ADJ. | —       | 7-10-77  | <i>[Signature]</i> |
|           | B  | REL FOR MFR                   | PS12345 | 1-19-78  | <i>[Signature]</i> |
|           | C  | INC E.O.                      | PS12461 | 10-27-78 | <i>[Signature]</i> |





- 3 RAISE DIODES CR4, CR5, CR6, CR7  $\frac{1}{8}$ "- $\frac{1}{4}$ " ABOVE PCB
- 2 MARK WITH CURRENT REVISION LETTER OF ASSEMBLY.
1. ASSEMBLE PER VARIAN WORKMANSHIP STD 87-800-192.

NOTES :

SEE SEPARATE LIST OF MATERIALS - LM 113902

|                                                                                          |  |                    |  |                                                                                                             |  |                                        |  |      |  |
|------------------------------------------------------------------------------------------|--|--------------------|--|-------------------------------------------------------------------------------------------------------------|--|----------------------------------------|--|------|--|
| QTY                                                                                      |  | IDENTIFYING NUMBER |  | DESCRIPTION                                                                                                 |  | CODE IDENT                             |  | ITEM |  |
| LIST OF MATERIALS                                                                        |  |                    |  | (VIA) varlan<br>MICROWAVE EQUIPMENT<br>OPERATIONS<br>SANTA ANA, CALIFORNIA                                  |  |                                        |  |      |  |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES                                   |  |                    |  | CONTRACT<br>NUMBER                                                                                          |  |                                        |  |      |  |
| DECIMALS 1PL 1 2PL 2 02<br>3PL = 005      FRAC = 1/64<br>ANG & 1"      SURFACE<br>FINISH |  |                    |  | CR <i>Jim Evans</i> 1-19-78<br>CHR <i>Jim</i> 1/24-78<br>APPD <i>Jim</i> 1/24-78<br>APPD <i>Jim</i> 1-24-78 |  | ASSEMBLY<br>HIGH VOLTAGE PCB-Z         |  |      |  |
| DESIGN ACTIVITY APPROVAL                                                                 |  |                    |  | CUSTOMER APPROVAL                                                                                           |  | SIZE CODE IDENT NO<br>D 59782 : 113902 |  |      |  |
| NEXT ASSEMBLY    USED ON                                                                 |  |                    |  | SPEC NO                                                                                                     |  | SCALE 2" = 1"      SHEET 1 OF 1        |  |      |  |
| APPLICATION                                                                              |  |                    |  | FINISH                                                                                                      |  |                                        |  |      |  |





|  <b>varian</b> |         | <b>MICROWAVE EQUIPMENT OPERATIONS</b> |     | TITLE: HIGH VOLTAGE PCB #2       |         | LM 113902 | REV C    |
|--------------------------------------------------------------------------------------------------|---------|---------------------------------------|-----|----------------------------------|---------|-----------|----------|
| CODE IDENT NO. 59782                                                                             |         | APPROVAL <i>[Signature]</i>           |     | DATE 12/1/78                     | 03254   |           |          |
| APPLICATION                                                                                      |         | REVISION                              |     |                                  |         |           |          |
| NEXT ASSEMBLY                                                                                    | USED ON | EO                                    | REV | DESCRIPTION                      | EO      | DATE      | APPROVED |
| D115919                                                                                          |         |                                       | A   | REVISED & RELEASED TO PRODUCTION | PS12345 | 1/19/78   | TS/MT    |
|                                                                                                  |         |                                       | B   | INC. E.O.                        | PS13595 | 5-12-81   | WA/283   |
|                                                                                                  |         |                                       | C   | INC E.O.                         | 15499   | 11/30/81  | JS/ KK   |
|                                                                                                  |         |                                       |     |                                  |         |           |          |
| REVISION STATUS                                                                                  |         |                                       |     |                                  |         |           |          |
| SHEET                                                                                            |         |                                       |     |                                  |         |           |          |
| LTR                                                                                              |         |                                       |     |                                  |         |           |          |
| SHEET                                                                                            |         |                                       |     |                                  |         |           |          |
| LTR                                                                                              |         |                                       |     |                                  |         |           |          |
| SHEET                                                                                            |         |                                       |     |                                  |         |           |          |
| LTR                                                                                              |         |                                       |     |                                  |         |           |          |



| varian  |         | MICROWAVE EQUIPMENT OPERATIONS      |  | HIGH VOLTAGE PCB #2 |          | LM 113902          | REV C           |
|---------|---------|-------------------------------------|--|---------------------|----------|--------------------|-----------------|
| ITEM NO | REF DES | DESCRIPTION                         |  | VARIAN PART NO      | MFG      | MFG OR MS PART NO. | QTY/DASH NO.    |
|         |         |                                     |  |                     |          |                    | -00 -01 -02 -03 |
| 1       |         | FABRICATION                         |  | C113901             |          |                    | 1               |
| 2       |         | SCHEMATIC                           |  | D113907             |          |                    | 2               |
| 3       |         |                                     |  |                     |          |                    |                 |
| 4       |         |                                     |  |                     |          |                    |                 |
| 5       | C1,2    | CAPACITOR, ELECT., 680 uf           |  | 41-507009           | SPRAGUE  | 672D687H6R3DM5C    | 2               |
| 6       | C3      | CAPACITOR, MYLAR, .1uf, 8000VDC 20% |  | 41-719307           | TRW      | X675HV104080W2     | 1               |
| 7       |         |                                     |  |                     |          |                    |                 |
| 8       |         |                                     |  |                     |          |                    |                 |
| 9       | CR1,2   | DIODE                               |  | 66-306079           |          | 1N6078             | 2               |
| 10      | CR3     | DIODE                               |  | 66-304958           |          | 1N4958             | 1               |
| 11      | CR4-7   | DIODE                               |  | 66-393324           | SEMATECH | SCF7500            | 4               |
| 12      | CR8,9   | DIODE                               |  | 66-300033           | H.V.D.   | CX513              | 2               |
| 13      |         |                                     |  |                     |          |                    |                 |
| 14      |         |                                     |  |                     |          |                    |                 |
| 15      | R1      | RESISTOR, 1K, 1/2W                  |  | 32-202410           |          | RC20GF102K         | 1               |
| 16      | R2,3    | RESISTOR, C.C., 100Ω, 2W, 5%        |  | 34-401310           |          | RC42GF101J         | 2               |
| 17      |         |                                     |  |                     |          |                    |                 |
| 18      | E1-E10  | TERMINAL                            |  | 16-229 946          | USECO    | 2011B-1            | 10              |
| 19      |         |                                     |  |                     |          |                    |                 |
| 20      |         | WIRE BAKE - FOR PULL TAIL           |  | 51-099 922          |          |                    | 4/A             |
| 21      |         |                                     |  |                     |          |                    |                 |













| varian  |         | MICROWAVE EQUIPMENT OPERATIONS | HIGH VOLTAGE PCB 21 |              | LM 113906          |              | REV F |         |
|---------|---------|--------------------------------|---------------------|--------------|--------------------|--------------|-------|---------|
| ITEM NO | REF DES | DESCRIPTION                    | VARIAN PART NO.     | MFG          | MFG OR MS PART NO. | QTY/DASH NO. |       |         |
|         |         |                                |                     |              |                    | -00          | -01   | -02 -03 |
| 1       |         | FABRICATION                    | 113905              |              |                    | 1            | 1     |         |
| 2       |         | SCHEMATIC                      | 113907              |              |                    | R            | -     |         |
| 3       |         | SCHEMATIC                      | 135758              |              |                    | -            | R     |         |
| 4       | C1-C6   | CAP., ELECT., .1uf, 8KV        | 41-719307           | TRW          | X675HV104080W2     | 6            | 6     |         |
| 5       | C7      | CAP., .56uf, 200V              | 41-724980           | ELECTRO-CUBE | 230B1C564K         | 1            | 1     |         |
| 6       |         |                                |                     |              |                    |              |       |         |
| 7       |         |                                |                     |              |                    |              |       |         |
| 8       | CR1     | DIODE                          | 66-300032           | H.V.D.       | VXS15              | 1            | 1     |         |
| 9       | CR2     | DIODE, ZENER, 200V, 1/2W       | 66-315281           | MOTOROLA     | 1N5281A            | 1            | 1     |         |
| 10      | CR3     | DIODE                          | 66-325378           | SEMTECH      | 1N5378B            | 1            | 1     |         |
| 11      | CR4,5   | DIODE                          | 66-304003           |              | 1N4003             | 2            | 2     |         |
| 12      |         |                                |                     |              |                    |              |       |         |
| 13      |         |                                |                     |              |                    |              |       |         |
| 14      |         |                                |                     |              |                    |              |       |         |
| 15      |         |                                |                     |              |                    |              |       |         |
| 16      |         |                                |                     |              |                    |              |       |         |
| 17      | L1      | INDUCTOR, H.V., 310 mH         | 113993              |              |                    | 1            | 1     | 1       |
| 18      |         |                                |                     |              |                    |              |       |         |
| 19      |         |                                |                     |              |                    |              |       |         |
| 20      |         |                                |                     |              |                    |              |       |         |
| 21      |         |                                |                     |              |                    |              |       |         |



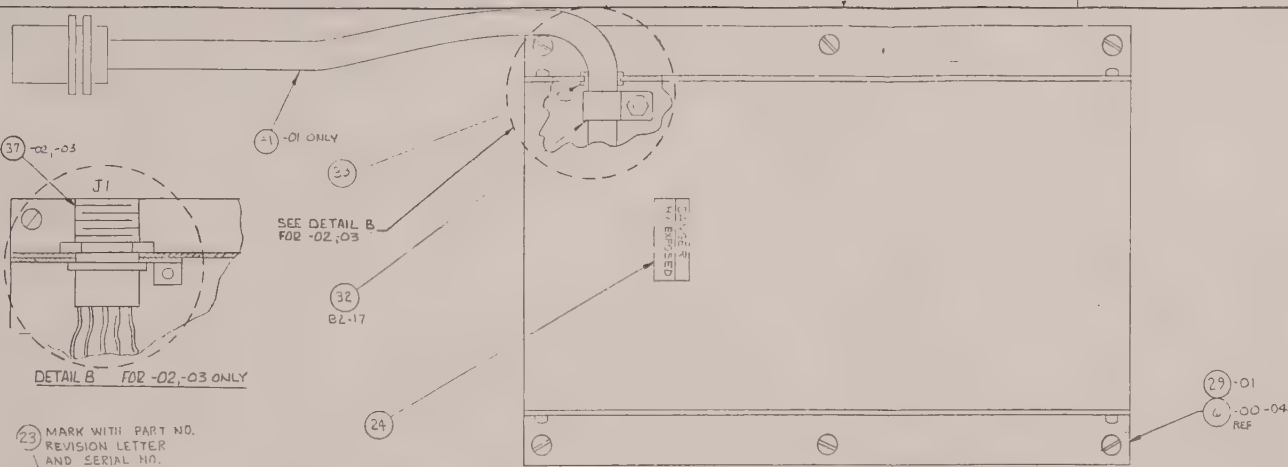
| varian  |         | MICROWAVE EQUIPMENT<br>OPERATIONS | HIGH VOLTAGE PCB 31 |                | LM 113906          |              | REV<br>F |         |
|---------|---------|-----------------------------------|---------------------|----------------|--------------------|--------------|----------|---------|
| ITEM NO | REF DES | DESCRIPTION                       | VARIAN PART NO.     | MFG            | MFG OR MS PART NO. | QTY/DASH NO. |          |         |
|         |         |                                   |                     |                |                    | -00          | -01      | -02 -03 |
| 22      | R1,11   | RESISTOR, W.W., 10 OHM, 10W       | 35-388-210          | OHMITE         | 1710               | 2            | 2        |         |
| 23      | R2,6    | RESISTOR, THK FILM, 3.5 MEG, 1%   | 31-600653           | PYROFILM       | PVC400             | 2            | 2        |         |
| 24      | R3-5    | RESISTOR, THK FILM, 1 MEG, 1%     | 31-600652           | PYROFILM       | PVC175             | 3            | 3        |         |
| 25      | R7,8    | RESISTOR, C.C., 1M OHM, 2W, 10%   | 34-402710           |                | RC42GF105K         | 2            | 2        |         |
| 26      | R9      | RESISTOR, C.C., 100 OHM, 1/4W, 5% | 32-301310           |                | RC07GF101J         | 1            | 1        |         |
| 27      | R10     | RESISTOR, C.C., 100 OHM, 1W, 5%   | 33-301310           |                | RC32GF101J         | 1            | 1        |         |
| 28      | R12     | RESISTOR, C.F., 3.6 OHM, 1/4W, 5% | 32-301136           |                |                    | -            | 1        |         |
| 29      |         |                                   |                     |                |                    |              |          |         |
| 30      |         |                                   |                     |                |                    |              |          |         |
| 31      | RV1     | VARISTOR                          | 55-400001           | G.E.           | V130LA20A          | 1            | 1        |         |
| 32      |         |                                   |                     |                |                    |              |          |         |
| 33      |         |                                   |                     |                |                    |              |          |         |
| 34      | Z1      | SPARK GAP PROTECTOR               | 55-500160           | SIEMENS        | B1A350             | 1            | 1        |         |
| 35      |         |                                   |                     |                |                    |              |          |         |
| 36      |         | WIRE, BUS, BARE #22 AWG           | 81-099922           |                |                    | AR           | AR       |         |
| 37      |         |                                   |                     |                |                    |              |          |         |
| 38      |         | CABLE TIE                         | 22-119654           | PAIDUIT        | SST3S              | AR           | AR       |         |
| 39      |         |                                   |                     |                |                    |              |          |         |
| 40      |         | SLEEVING, INSULATING #22          | 88-494803           | BENTLEY-HARRIS | BH1151-HB1         | AR           | AR       |         |
| 41      |         |                                   |                     |                |                    |              |          |         |
|         |         |                                   |                     |                |                    |              |          |         |



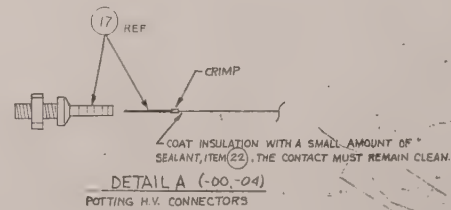
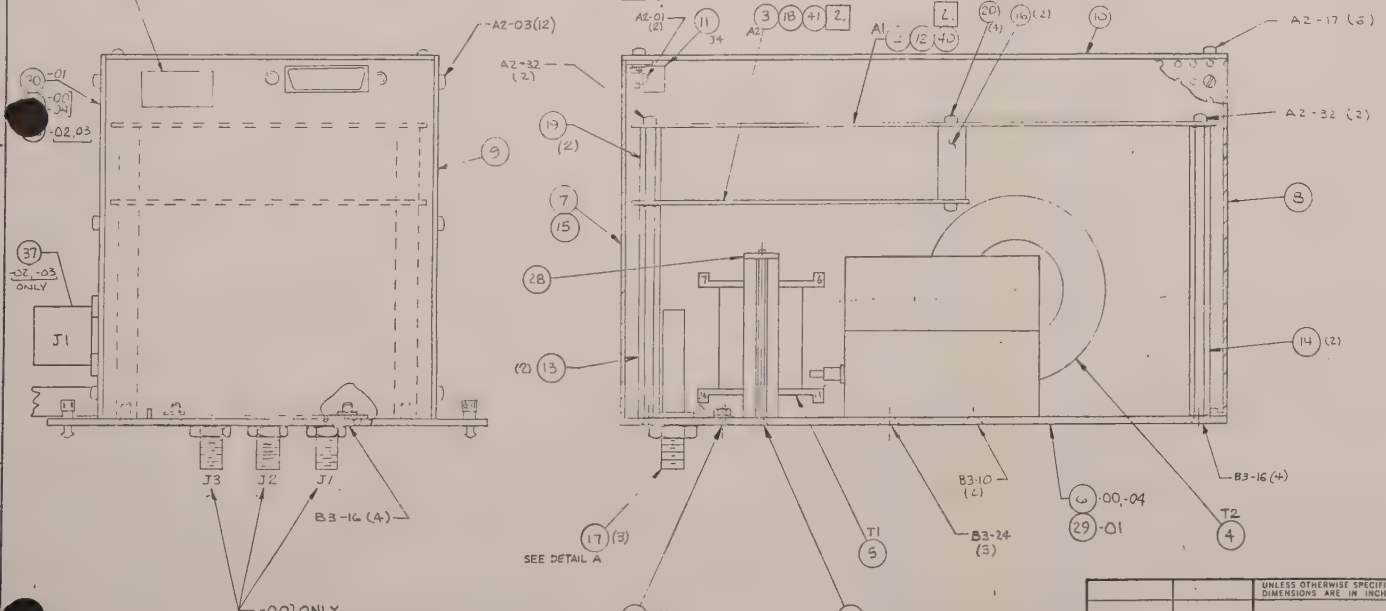








| REVISIONS |                      |          |          |          |
|-----------|----------------------|----------|----------|----------|
| DATE      | DESCRIPTION          | ED       | DATE     | APPROVED |
| 11/15/77  | 1. REVISED & REDRAWN | PS 1345  | 11/15/77 | PS       |
| 11/19/78  | 2. REVISED & REDRAWN | PS 12498 | 11/19/78 | PS       |
| 11/24/78  | 3. REVISED PER E.O.  | PS 12585 | 11/24/78 | PS       |
| 11/24/78  | 4. REVISED PER E.O.  | PS 12585 | 11/24/78 | PS       |
| 11/24/78  | 5. INC. E.O.         | PS 13060 | 11/24/78 | PS       |
| 11/24/78  | 6. INC. E.O.         | PS 13371 | 11/24/78 | PS       |
| 11/24/78  | 7. INC. E.O.         | PS 13372 | 11/24/78 | PS       |
| 11/24/78  | 8. INC. E.O.         | PS 14771 | 11/24/78 | PS       |
| 11/24/78  | 9. INC. E.O.         | PS 15047 | 11/24/78 | PS       |
| 11/24/78  | 10. INC. E.O.        | PS 15373 | 11/24/78 | PS       |
| 11/24/78  | 11. INC. E.O.        | PS 1672  | 11/24/78 | PS       |
| 11/24/78  | 12. INC. E.O.        | PS 18416 | 11/24/78 | PS       |
| 11/24/78  | 13. INC. E.O.        | PS 19548 | 11/24/78 | PS       |
| 20952     | 14. INC. E.O.        | 20952    | 20971    | 20866    |
| 22732     | 15. INC. E.O.        | 22732    | 22732    | 22732    |
| 24600     | 16. INC. E.O.        | 24600    | 24600    | 24600    |



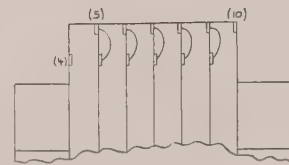
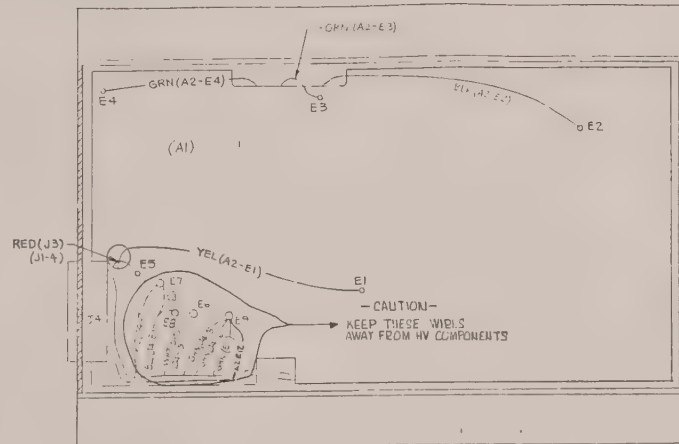
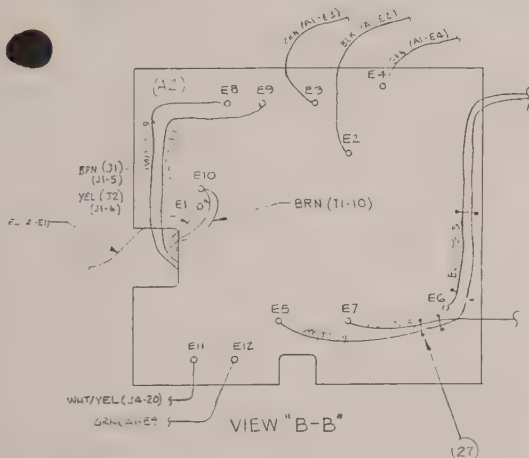
2. CONFORMAL COAT A1 & A2 PCB ASSY'S (ONLY) WITH ITEM 21 IN ACCORDANCE WITH SPEC. 129130. MASK OFF & DO NOT COAT E10-E14 ON A1, & DO NOT COAT BLUE OR GREY H.V. LEADS FROM T2-9, 10 TO A2-E5 & E6.

1. ASSEMBLE USING HARDWARE DWS 1100005

|                                                                                                                                                                                                                                                                                                                                                                                                                             |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |                     |  |                         |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|-------------------------|--|
| CONTRACT NUMBER                                                                                                                                                                                                                                                                                                                                                                                                             |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | CODE IDENT          |  | ITEM                    |  |
| E113979                                                                                                                                                                                                                                                                                                                                                                                                                     |  | 100/200W TWA                                                                                                                                                                                                                                                                                                                                                                                                                                         |  | D 59782             |  | 113919                  |  |
| NEXT ASSEMBLY                                                                                                                                                                                                                                                                                                                                                                                                               |  | USED ON                                                                                                                                                                                                                                                                                                                                                                                                                                              |  | FINISH              |  |                         |  |
| APPLICATION                                                                                                                                                                                                                                                                                                                                                                                                                 |  | DESIGN ACTIVITY APPROVAL                                                                                                                                                                                                                                                                                                                                                                                                                             |  | CUSTOMER APPROVAL   |  |                         |  |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES                                                                                                                                                                                                                                                                                                                                                                         |  | CONTRACT NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                      |  | LIST OF MATERIALS   |  |                         |  |
| DECIMALS: 1PL 2, 2PL 02                                                                                                                                                                                                                                                                                                                                                                                                     |  | OR FRACTIONS: 1/2, 1/4, 3/8, 1/2, 3/4, 1, 1 1/2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 |  | MICROWAVE EQUIPMENT |  | SANTA CLARA, CALIFORNIA |  |
| 3PL 1/2, 3/4, 1, 1 1/2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 |  | FRAC 1/2, 1/4, 3/8, 1/2, 3/4, 1, 1 1/2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100          |  | ASSEMBLY            |  | HIGH VOLTAGE MODULE     |  |
| ANG 1°                                                                                                                                                                                                                                                                                                                                                                                                                      |  | SURFACE FINISH                                                                                                                                                                                                                                                                                                                                                                                                                                       |  | SIZE                |  | CODE IDENT NO.          |  |
| MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                    |  | APPD                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | D 59782             |  | 113919                  |  |
| DESIGN ACTIVITY APPROVAL                                                                                                                                                                                                                                                                                                                                                                                                    |  | CUSTOMER APPROVAL                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | SCALE               |  | CLASS                   |  |
| SPEC NO.                                                                                                                                                                                                                                                                                                                                                                                                                    |  | FINISH                                                                                                                                                                                                                                                                                                                                                                                                                                               |  | SHEET               |  | 1 OF 2                  |  |

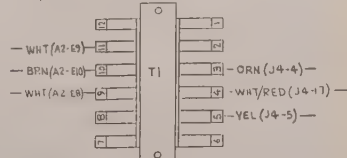
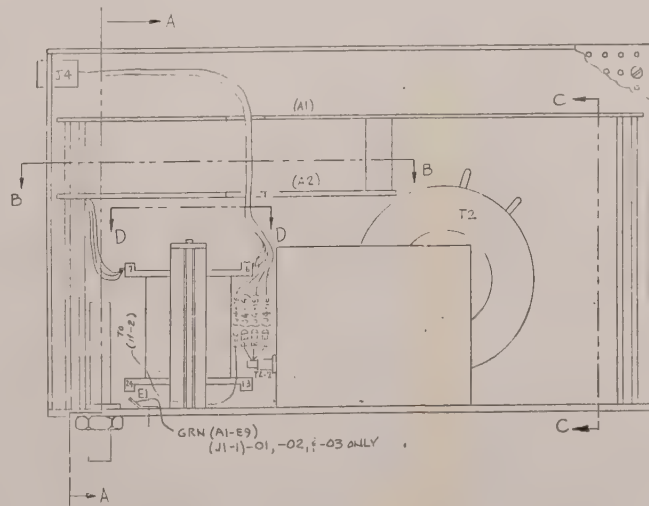
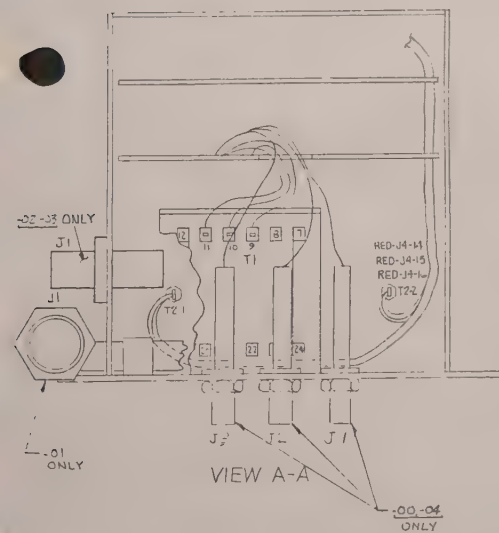


| REVISIONS  |     |             |                  |
|------------|-----|-------------|------------------|
| ZONE       | STR | DESCRIPTION | ED DATE APPROVED |
| SEE SHT #1 |     |             |                  |



WIRE & CONNECTIONS NOT INCLUDED IN WIRING HARNESS

| DASH NO. | NO. | FROM  | TO    | WIRE TYPE          | WIRE PART NO. | ANG | COLOR   | LENGTH |
|----------|-----|-------|-------|--------------------|---------------|-----|---------|--------|
| 1        | 1   | A1E1  | A2E1  | HV                 | 81-259754     | 20  | YEL     | 1'     |
| 2        | 2   | A1E2  | A2E2  | HV                 | 81-259755     | 20  | BLK     | 1'     |
| 3        | 3   | A1E3  | A2E3  | HV                 | 81-259753     | 20  | GRN     | 1'     |
| 4        | 4   | A1E4  | A2E4  | HV                 | 81-259755     | 20  | GRN     | 1'     |
| 5        | 5   | A1E5  | J3    | HV                 | 81-259752     | 20  | RED     | 1'     |
| 6        | 6   | A1E1  | J2    | HV                 | 81-259754     | 20  | YEL     | 1'     |
| 7        | 7   | A2E5  | T2-10 | HV                 | 81-259758     | 20  | GRY     | 1'     |
| 8        | 8   | A2E6  | T2-9  | HV                 | 81-259756     | 20  | BLU     | 1'     |
| 9        | 9   | A2E7  | T2-4  | HV                 | 81-259757     | 20  | VIO     | 1'     |
| 10       | 10  | A2E8  | T1-9  | HV                 | 81-259755     | 20  | HWP     | 1'     |
| 11       | 11  | A2E9  | T1-11 | HV                 | 81-259759     | 20  | HWT     | 1'     |
| 12       | 12  | A2E10 | J1    | HV                 | 81-259751     | 20  | BRN     | 1'     |
| 13       | 13  | A2E10 | T1-10 | HV                 | 81-259751     | 20  | BRN     | 1'     |
| 14       | 14  | J1-1  | E1    | SELF LEADS FROM J1 |               |     | GRN     |        |
| 15       | 15  | J1-2  | J2-5  |                    |               |     | RED     |        |
| 16       | 16  | J1-4  | A1E5  |                    |               |     | RED     |        |
| 17       | 17  | J1-5  | A2E10 |                    |               |     | GRN     |        |
| 18       | 18  | J1-6  | A2E1  |                    |               |     | YEL     |        |
| 19       | 19  | J1-7  | E1    |                    |               |     | BLK     |        |
| 20       | 20  | J4-20 | A2E11 | SELF LEADS         |               |     | WHT/YEL |        |
| 21       | 21  | A2E12 | A1E9  | SELF LEADS         |               |     | GRN     |        |



SEE SEPARATE LM 113919

| QTY                            | IDENTIFYING NUMBER | DESCRIPTION | CODE IDENT | ITEM |
|--------------------------------|--------------------|-------------|------------|------|
| LIST OF MATERIALS              |                    |             |            |      |
| CONTRACT NUMBER                |                    |             |            |      |
| OR H. ROCCO 4-6-78             |                    |             |            |      |
| CHECK                          |                    |             |            |      |
| APPROVED                       |                    |             |            |      |
| APPROVED                       |                    |             |            |      |
| DESIGN ACTIVITY APPROVAL       |                    |             |            |      |
| CUSTOMER APPROVAL              |                    |             |            |      |
| SIZE CODE IDENT NO.            |                    |             |            |      |
| D 59782 113919                 |                    |             |            |      |
| SCALE 1/1 CLASS A SHEET 2 OF 2 |                    |             |            |      |

| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | CONTRACT NUMBER    | DESCRIPTION                    | CODE IDENT | ITEM |
|-----------------------------------------------------|--------------------|--------------------------------|------------|------|
| DECIMALS: 1PL ± 1 2PL ± 0.2                         | OR H. ROCCO 4-6-78 | CHECK                          |            |      |
| 3PL ± 0.05                                          | FRAC ± 1/64        | APPROVED                       |            |      |
| ANG ± 1°                                            | SURFACE FINISH     | APPROVED                       |            |      |
| MATERIAL                                            |                    | DESIGN ACTIVITY APPROVAL       |            |      |
|                                                     |                    | CUSTOMER APPROVAL              |            |      |
|                                                     |                    | SIZE CODE IDENT NO.            |            |      |
|                                                     |                    | D 59782 113919                 |            |      |
|                                                     |                    | SCALE 1/1 CLASS A SHEET 2 OF 2 |            |      |

THESE CONNECTIONS MAY BE CHANGED BY TECHNICIAN.

21. LEGEND: BLK (J4-1) = WIRE COLOR (DESTINATION).

NOTES:











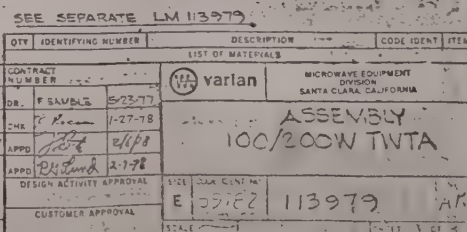


|             |         | MICROWAVE EQUIPMENT<br>DIVISION |                 | ASSY, H.V. MODULE |                     | LM 113919 |     | REV<br>T |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-------------|---------|---------------------------------|-----------------|-------------------|---------------------|-----------|-----|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| ITEM<br>NO. | REF DES | DESCRIPTION                     | VARIAN PART NO. | MFG.              | MFG. OR MS PART NO. | .00       | .01 | .02      | .03 | .04 | .05 | .06 | .07 | .08 | .09 | .10 | .11 | .12 | .13 | .14 | .15 | .16 | .17 | .18 | .19 | .20 | .21 | .22 | .23 | .24 | .25 | .26 | .27 | .28 | .29 |  |
| 27          |         | CABLE TIE                       | 22-119650       | PANDUIT           | SST1M               | 5         | 5   | 5        | 5   | 5   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 28          |         | TRANSFORMER CLAMP               | B113095-01      |                   |                     | 1         | 1   | 1        | 1   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 29          |         | BASE PLATE                      | C113913-01      |                   |                     | -         | 1   | 1        | 1   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 30          |         | SIDE PLATE                      | C113917-02      |                   |                     | -         | 1   | -        | -   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 31          | J1      | ASSY, HIGH VOLTAGE CABLE        | C135751         |                   |                     | -         | 1   | -        | -   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 32          |         | CLAMP, CABLE                    | 22-117990       | TA IFG.           | TA1720-08           | -         | 1   | -        | -   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 33          |         | GROMMET, FLEXIBLE               | 24-389052       | HECKESSER         | WG201               | -         | 1   | -        | -   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 34          |         | SCREW, FLAT HD, 4-40 x 3/8 LG   | 12-212004-06    |                   |                     | 1         | 1   | 1        | 1   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 35          |         | NUT, HEX, 4-40                  | 13-102004       |                   |                     | 1         | 1   | 1        | 1   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 36          |         | SIDE PLATE                      | C113917-03      |                   |                     | -         | -   | 1        | 1   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 37          | J1      | ASSY, HIGH VOLTAGE CABLE        | B01000360       |                   |                     | -         | -   | 1        | 1   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 38          |         | SCHEMATIC                       | D01002996       |                   |                     | -         | -   | -        | R   | -   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 39          |         |                                 |                 |                   |                     |           |     |          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 40          | A1      | PCB #1, MOD                     | B01003534-07    |                   |                     | -         | -   | -        | -   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 41          | A2      | PCB #2, MOD                     | B01003524-08    |                   |                     | -         | -   | -        | -   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 42          |         |                                 |                 |                   |                     |           |     |          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 43          |         |                                 |                 |                   |                     |           |     |          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 44          |         | HV WIRE, YEL, 20 AWG            | 81-259754       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 45          |         | HV WIRE, BLK, 20 AWG            | 81-259750       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 46          |         | HV WIRE, ORN, 20 AWG            | 81-259753       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 47          |         | HV WIRE, GRN, 20 AWG            | 81-259755       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 48          |         | HV WIRE, RED, 20 AWG            | 81-259752       |                   |                     | AR        | -   | -        | -   | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 49          |         | HV WIRE, GRY, 20 AWG            | 81-259758       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 50          |         | HV WIRE, BLU, 20 AWG            | 81-259756       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 51          |         | HV WIRE, VIO, 20 AWG            | 81-259757       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 52          |         | HV WIRE, WHT, 20 AWG            | 81-259759       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 53          |         | HV WIRE, BRN, 20 AWG            | 81-259751       |                   |                     | AR        | AR  | AR       | AR  | AR  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |

MICROFILM

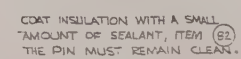
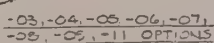
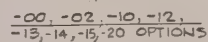








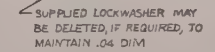




DETAIL "A"

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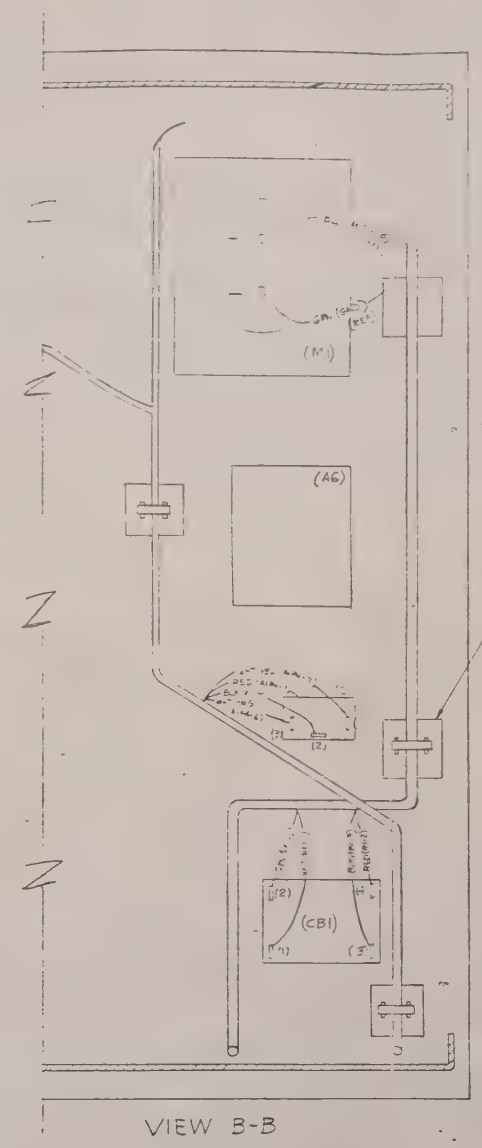
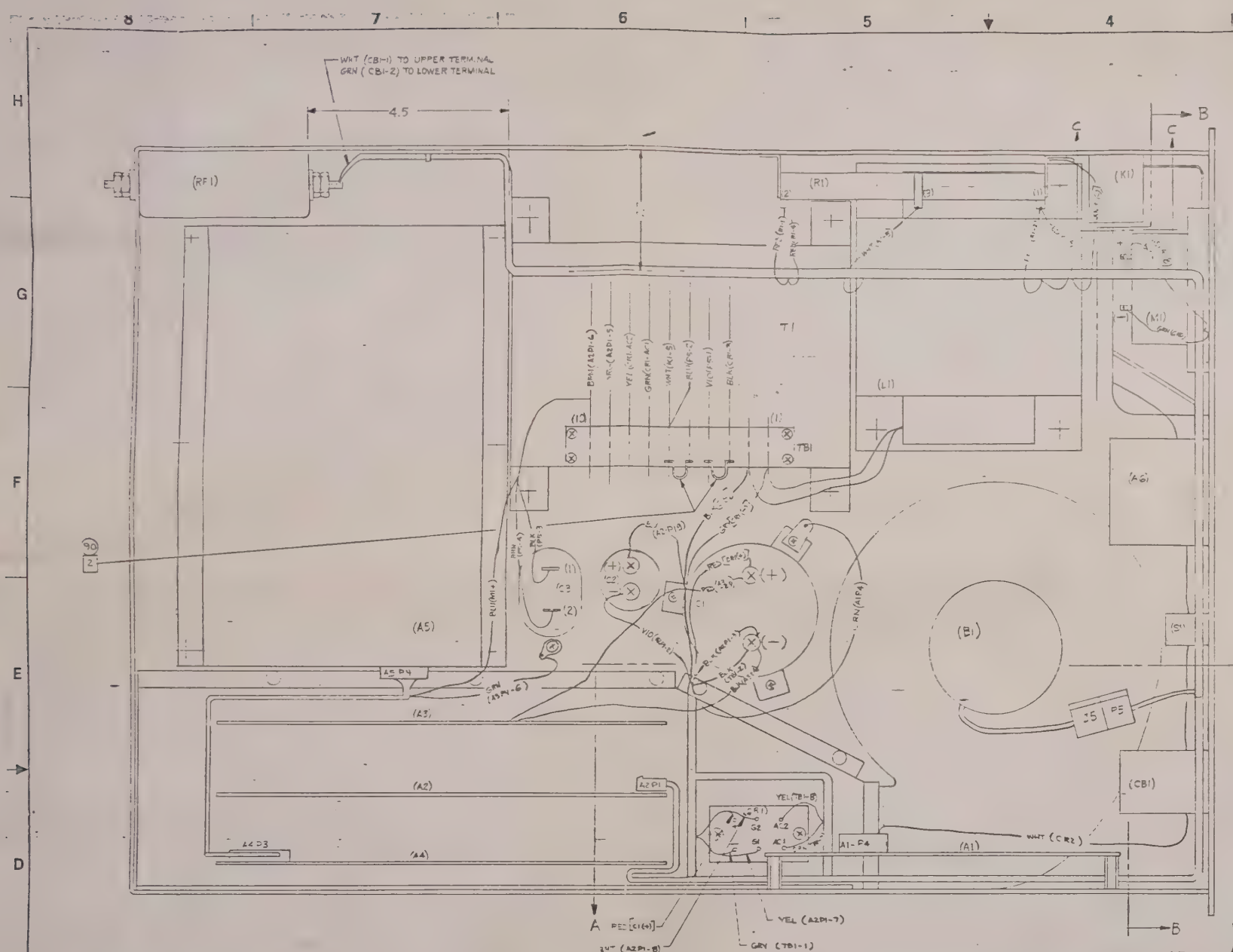
POTTING HV CONNECTORS



|                          |  |                                                                                                     |  |                                                            |  |            |  |              |  |
|--------------------------|--|-----------------------------------------------------------------------------------------------------|--|------------------------------------------------------------|--|------------|--|--------------|--|
| QTY                      |  | IDENTIFYING NUMBER                                                                                  |  | LIST OF MATERIALS                                          |  | CODE IDENT |  | ITEM         |  |
| CONTRACT NUMBER          |  |  <b>varian</b> |  | MICROWAVE EQUIPMENT<br>DIVISION<br>SANTA CLARA, CALIFORNIA |  |            |  |              |  |
| OR F 54-27               |  |                                                                                                     |  | ASSEMBLY<br>100/200W TWTAs                                 |  |            |  |              |  |
| CNR 21600 2-27-78        |  |                                                                                                     |  |                                                            |  |            |  |              |  |
| ✓ APPD 154 3/4/79        |  | APPD 154 2-27-78                                                                                    |  | SIZE CODE IDENT NO                                         |  | E 59782    |  | 113 979      |  |
| DESIGN ACTIVITY APPROVAL |  |                                                                                                     |  | CUSTOMER APPROVAL                                          |  |            |  |              |  |
| SCALE                    |  |                                                                                                     |  | SUPERSEDES                                                 |  |            |  | SHEET 2 of 3 |  |

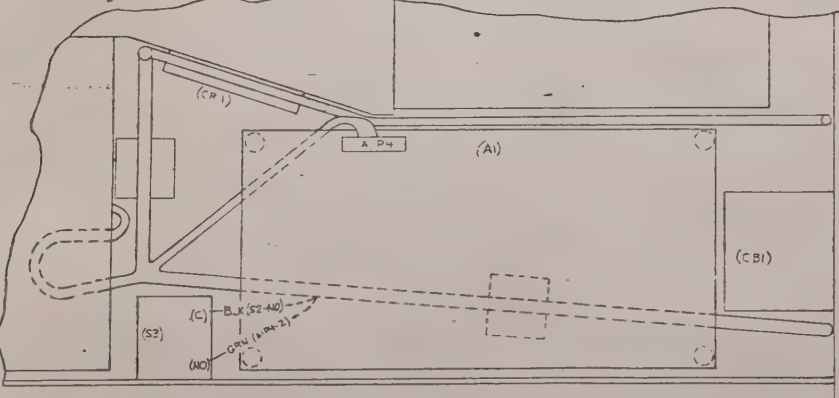
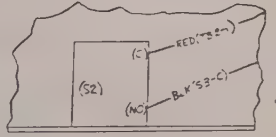
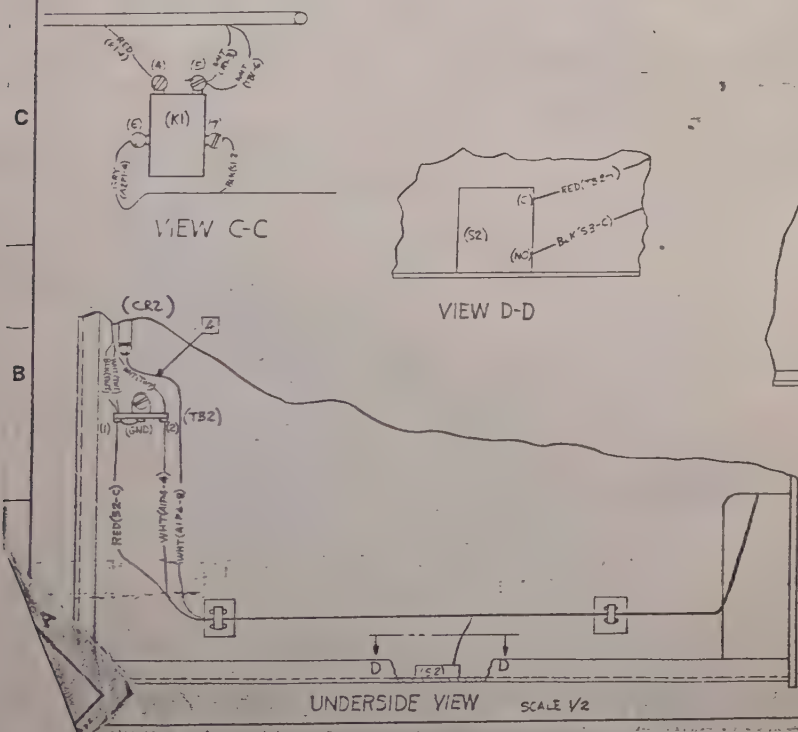






| NO. | FROM | TO   | WIRE COLOR | LENGTH |
|-----|------|------|------------|--------|
| 1   | CB-1 | PS-3 | BLK        |        |
| 2   | AS-1 | AS-2 | GRN        |        |
| 3   | CB-1 | CB-2 | GRN        |        |
| 4   | CB-1 | CB-2 | GRN        |        |
| 5   | CB-1 | CB-2 | GRN        |        |
| 6   | CB-1 | CB-2 | GRN        |        |
| 7   | CB-1 | CB-2 | GRN        |        |
| 8   | CB-1 | CB-2 | GRN        |        |
| 9   | CB-1 | CB-2 | GRN        |        |
| 10  | CB-1 | CB-2 | GRN        |        |
| 11  | CB-1 | CB-2 | GRN        |        |
| 12  | CB-1 | CB-2 | GRN        |        |
| 13  | CB-1 | CB-2 | GRN        |        |
| 14  | CB-1 | CB-2 | GRN        |        |
| 15  | CB-1 | CB-2 | GRN        |        |
| 16  | CB-1 | CB-2 | GRN        |        |
| 17  | CB-1 | CB-2 | GRN        |        |
| 18  | CB-1 | CB-2 | GRN        |        |
| 19  | CB-1 | CB-2 | GRN        |        |
| 20  | CB-1 | CB-2 | GRN        |        |
| 21  | CB-1 | CB-2 | GRN        |        |
| 22  | CB-1 | CB-2 | GRN        |        |
| 23  | CB-1 | CB-2 | GRN        |        |
| 24  | CB-1 | CB-2 | GRN        |        |
| 25  | CB-1 | CB-2 | GRN        |        |
| 26  | CB-1 | CB-2 | GRN        |        |
| 27  | CB-1 | CB-2 | GRN        |        |
| 28  | CB-1 | CB-2 | GRN        |        |
| 29  | CB-1 | CB-2 | GRN        |        |
| 30  | CB-1 | CB-2 | GRN        |        |
| 31  | CB-1 | CB-2 | GRN        |        |
| 32  | CB-1 | CB-2 | GRN        |        |
| 33  | CB-1 | CB-2 | GRN        |        |
| 34  | CB-1 | CB-2 | GRN        |        |
| 35  | CB-1 | CB-2 | GRN        |        |
| 36  | CB-1 | CB-2 | GRN        |        |
| 37  | CB-1 | CB-2 | GRN        |        |
| 38  | CB-1 | CB-2 | GRN        |        |
| 39  | CB-1 | CB-2 | GRN        |        |
| 40  | CB-1 | CB-2 | GRN        |        |
| 41  | CB-1 | CB-2 | GRN        |        |
| 42  | CB-1 | CB-2 | GRN        |        |
| 43  | CB-1 | CB-2 | GRN        |        |
| 44  | CB-1 | CB-2 | GRN        |        |
| 45  | CB-1 | CB-2 | GRN        |        |
| 46  | CB-1 | CB-2 | GRN        |        |
| 47  | CB-1 | CB-2 | GRN        |        |
| 48  | CB-1 | CB-2 | GRN        |        |
| 49  | CB-1 | CB-2 | GRN        |        |
| 50  | CB-1 | CB-2 | GRN        |        |
| 51  | CB-1 | CB-2 | GRN        |        |
| 52  | CB-1 | CB-2 | GRN        |        |
| 53  | CB-1 | CB-2 | GRN        |        |
| 54  | CB-1 | CB-2 | GRN        |        |
| 55  | CB-1 | CB-2 | GRN        |        |
| 56  | CB-1 | CB-2 | GRN        |        |
| 57  | CB-1 | CB-2 | GRN        |        |
| 58  | CB-1 | CB-2 | GRN        |        |
| 59  | CB-1 | CB-2 | GRN        |        |
| 60  | CB-1 | CB-2 | GRN        |        |
| 61  | CB-1 | CB-2 | GRN        |        |
| 62  | CB-1 | CB-2 | GRN        |        |
| 63  | CB-1 | CB-2 | GRN        |        |
| 64  | CB-1 | CB-2 | GRN        |        |
| 65  | CB-1 | CB-2 | GRN        |        |
| 66  | CB-1 | CB-2 | GRN        |        |
| 67  | CB-1 | CB-2 | GRN        |        |
| 68  | CB-1 | CB-2 | GRN        |        |
| 69  | CB-1 | CB-2 | GRN        |        |
| 70  | CB-1 | CB-2 | GRN        |        |
| 71  | CB-1 | CB-2 | GRN        |        |
| 72  | CB-1 | CB-2 | GRN        |        |
| 73  | CB-1 | CB-2 | GRN        |        |
| 74  | CB-1 | CB-2 | GRN        |        |
| 75  | CB-1 | CB-2 | GRN        |        |
| 76  | CB-1 | CB-2 | GRN        |        |
| 77  | CB-1 | CB-2 | GRN        |        |
| 78  | CB-1 | CB-2 | GRN        |        |
| 79  | CB-1 | CB-2 | GRN        |        |
| 80  | CB-1 | CB-2 | GRN        |        |
| 81  | CB-1 | CB-2 | GRN        |        |
| 82  | CB-1 | CB-2 | GRN        |        |
| 83  | CB-1 | CB-2 | GRN        |        |
| 84  | CB-1 | CB-2 | GRN        |        |
| 85  | CB-1 | CB-2 | GRN        |        |
| 86  | CB-1 | CB-2 | GRN        |        |
| 87  | CB-1 | CB-2 | GRN        |        |
| 88  | CB-1 | CB-2 | GRN        |        |
| 89  | CB-1 | CB-2 | GRN        |        |
| 90  | CB-1 | CB-2 | GRN        |        |
| 91  | CB-1 | CB-2 | GRN        |        |
| 92  | CB-1 | CB-2 | GRN        |        |
| 93  | CB-1 | CB-2 | GRN        |        |
| 94  | CB-1 | CB-2 | GRN        |        |
| 95  | CB-1 | CB-2 | GRN        |        |
| 96  | CB-1 | CB-2 | GRN        |        |
| 97  | CB-1 | CB-2 | GRN        |        |
| 98  | CB-1 | CB-2 | GRN        |        |
| 99  | CB-1 | CB-2 | GRN        |        |
| 100 | CB-1 | CB-2 | GRN        |        |

VIEW B-B



VIEW A-A

- NOTES:
- FOR ELAPSED TIME METER OPTION ONLY. (SEE ITEMS 10 & 11)
  - SECURE HARNESS TO CHASSIS USING ADHESIVE BACKED CABLE CLAMPS, ITEM 91, AND CABLE TIE ITEM 92.
  - JUMPER B TO BE USED WITH 115V/230V OPTIONS ONLY. CUT BACK AND INSULATE SHIELD CONNECTION AT A/P END.
  - JUMPER B & A ARE SELF-LEADS FROM A3 AND ARE TO BE TWISTED TOGETHER.
  - CONNECTIONS ARE SHOWN FOR 115V OPERATION. FOR 230V OPERATION REMOVE BOTH STRAPS, ITEM 90, FROM TB1-3 TO TB1-4 AND TB1-5 TO TB1-6 AND INSTALL ONE STRAP FROM TB1-4 TO TB1-5. REMOVE JUMPER (RED WIRE) BETWEEN RH AND R1-2. TRANSFER RED WIRE (CB1-6) FROM R1-2 TO R1-1. TRANSFER WHITE WIRE (C1-3) FROM R1-3 TO R1-2. PLACE 230V LABEL OVER 115V LABEL (ITEM 121).
  - LEGEND: BLACK (P3-6) = WIRE COLOR (DESTINATION).

UNDERSIDE VIEW SCALE 1/2

| NO. | FROM     | TERMINATION | TO   | TERMINATION | WIRE TYPE | WIRE PART NO. | WIRE COLOR | LENGTH |
|-----|----------|-------------|------|-------------|-----------|---------------|------------|--------|
| 1   | CB-1     | 5-604-5     | L-1  |             |           |               |            |        |
| 2   | CB-2     | 5-604-5     | L-2  |             |           |               |            |        |
| 3   | C1-1     | 5-604-12    | A3-B |             |           |               |            |        |
| 4   | C1-1     | 5-604-12    | A3-E |             |           |               |            |        |
| 5   | CR-2     | 5-604-10    | A3-B |             |           |               |            |        |
| 6   | TB-1     |             | TB-1 |             |           |               |            |        |
| 7   | TB-1     |             | TB-1 |             |           |               |            |        |
| 8   | TB-1     |             | TB-1 |             |           |               |            |        |
| 9   | TB-1     |             | TB-1 |             |           |               |            |        |
| 10  | ET METER |             | TB-1 |             |           |               |            |        |
| 11  | ET METER |             | TB-1 |             |           |               |            |        |

|                                                     |  |                   |  |                         |  |                   |  |
|-----------------------------------------------------|--|-------------------|--|-------------------------|--|-------------------|--|
| QTY IDENTIFYING NUMBER                              |  | DESCRIPTION       |  | CODE IDENT              |  | ITEM              |  |
| CONTRACT NUMBER                                     |  | LIST OF MATERIALS |  | MICROWAVE EQUIPMENT     |  | DIVISION          |  |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |  | VARIAN            |  | SANTA CLARA, CALIFORNIA |  |                   |  |
| DECIMALS: 3PL ± 0.03                                |  | FRAC: 1/8         |  | SURFACE FINISH          |  | APPRO: 2/2/78     |  |
| 3PL ± 0.05                                          |  | FRAC: 1/8         |  | SURFACE FINISH          |  | APPRO: 2/2/78     |  |
| ANG ± 1°                                            |  | SURFACE FINISH    |  | APPRO: 2/2/78           |  | APPRO: 2/2/78     |  |
| MATERIAL                                            |  | APPRO: 2/2/78     |  | APPRO: 2/2/78           |  | APPRO: 2/2/78     |  |
| 100/200 W                                           |  | APPRO: 2/2/78     |  | APPRO: 2/2/78           |  | APPRO: 2/2/78     |  |
| WEST ASSEMBLY                                       |  | USED ON           |  | SPEC NO.                |  | CUSTOMER APPROVAL |  |
| APPLICATION                                         |  | FINISH            |  | SCALE 1/1               |  | SHEET 3 OF 3      |  |

































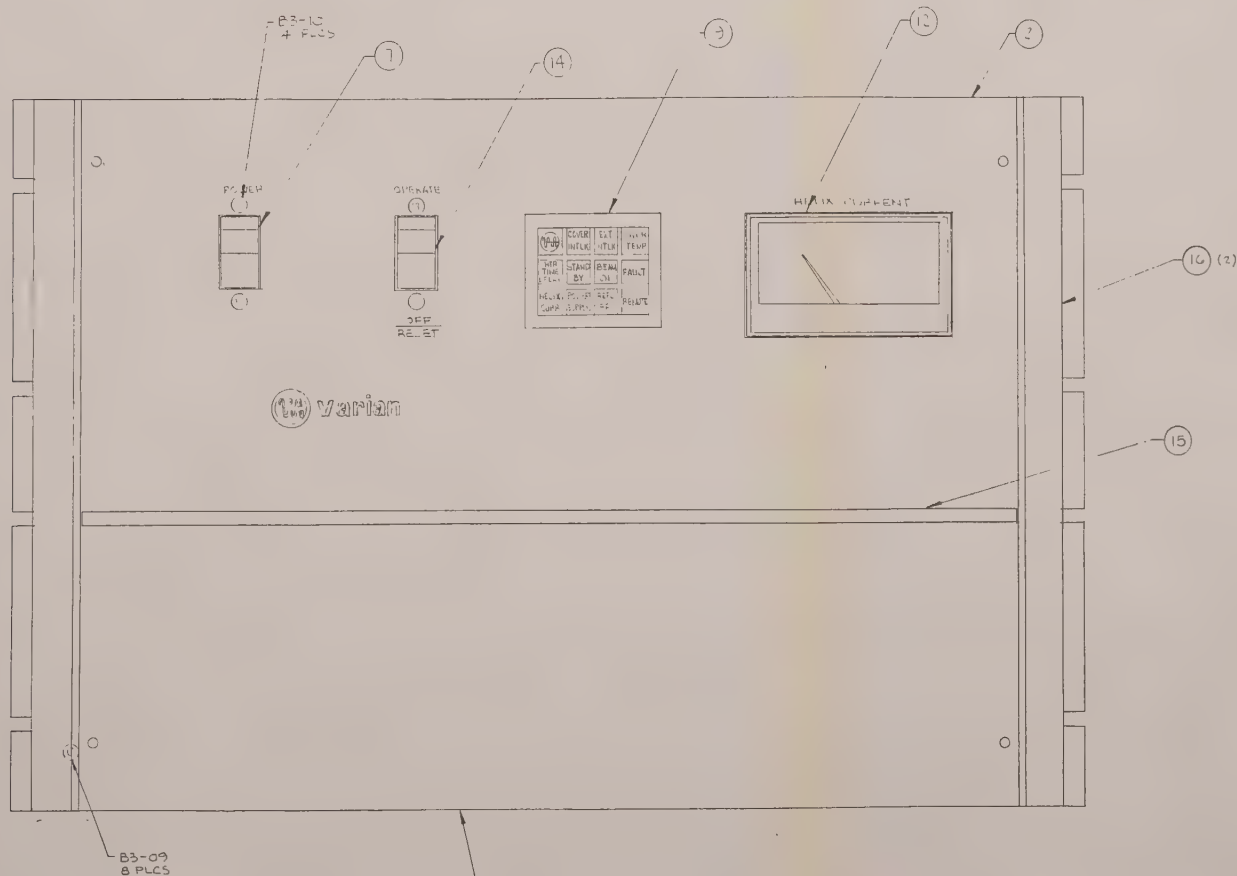








| REVISIONS |     |                                                    |          |          |
|-----------|-----|----------------------------------------------------|----------|----------|
| ZONE      | LTW | DESCRIPTION                                        | ED       | DATE     |
| A         |     | VARIAN LABEL REPLACED WITH SILKSCREEN, REL TO MFR. | PS-12286 | 12-21-77 |
| B         |     | INCORPORATE EO                                     | PS-12353 | 3-15-78  |
| C         |     | LM REVISED, ADDED -01 OPTION                       | PS-12446 | 3-15-78  |
| D         |     | LM REVISED, ADDED -02 OPTION                       | PS-12516 | 5-26-78  |
| E         |     | LM REVISED, ADDED -03 OPTION                       | PS-12614 | 5-26-78  |



SEE SEPARATE LM 129054

| QTY                      | IDENTIFYING NUMBER | DESCRIPTION                                            | CODE IDENT | ITEM |
|--------------------------|--------------------|--------------------------------------------------------|------------|------|
| LIST OF MATERIALS        |                    |                                                        |            |      |
| CONTRACT NUMBER          |                    | MICROWAVE EQUIPMENT OPERATIONS SANTA CLARA, CALIFORNIA |            |      |
| OR                       | F. GAMBLE          | 5-17-77                                                |            |      |
| CHK                      | W. GAMBLE          | 5-16-77                                                |            |      |
| APPD                     | W. GAMBLE          | 5-17-77                                                |            |      |
| DESIGN ACTIVITY APPROVAL |                    | SIZE CODE IDENT NO                                     |            |      |
| CUSTOMER APPROVAL        |                    | D 99313 129054 E                                       |            |      |
| SCALE 1/1                |                    | SHEET 1 OF 1                                           |            |      |

|                                                     |                |
|-----------------------------------------------------|----------------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |                |
| DECIMALS: 1PL ± .1 2PL ± .02                        |                |
| 3PL ± .005                                          | FRAC ± 1/64    |
| ANG ± 1°                                            | SURFACE FINISH |
| MATERIAL                                            |                |
| 113479                                              | 129054 TWTA    |
| NEXT ASSEMBLY                                       | USED ON        |
| APPLICATION                                         | FINISH         |





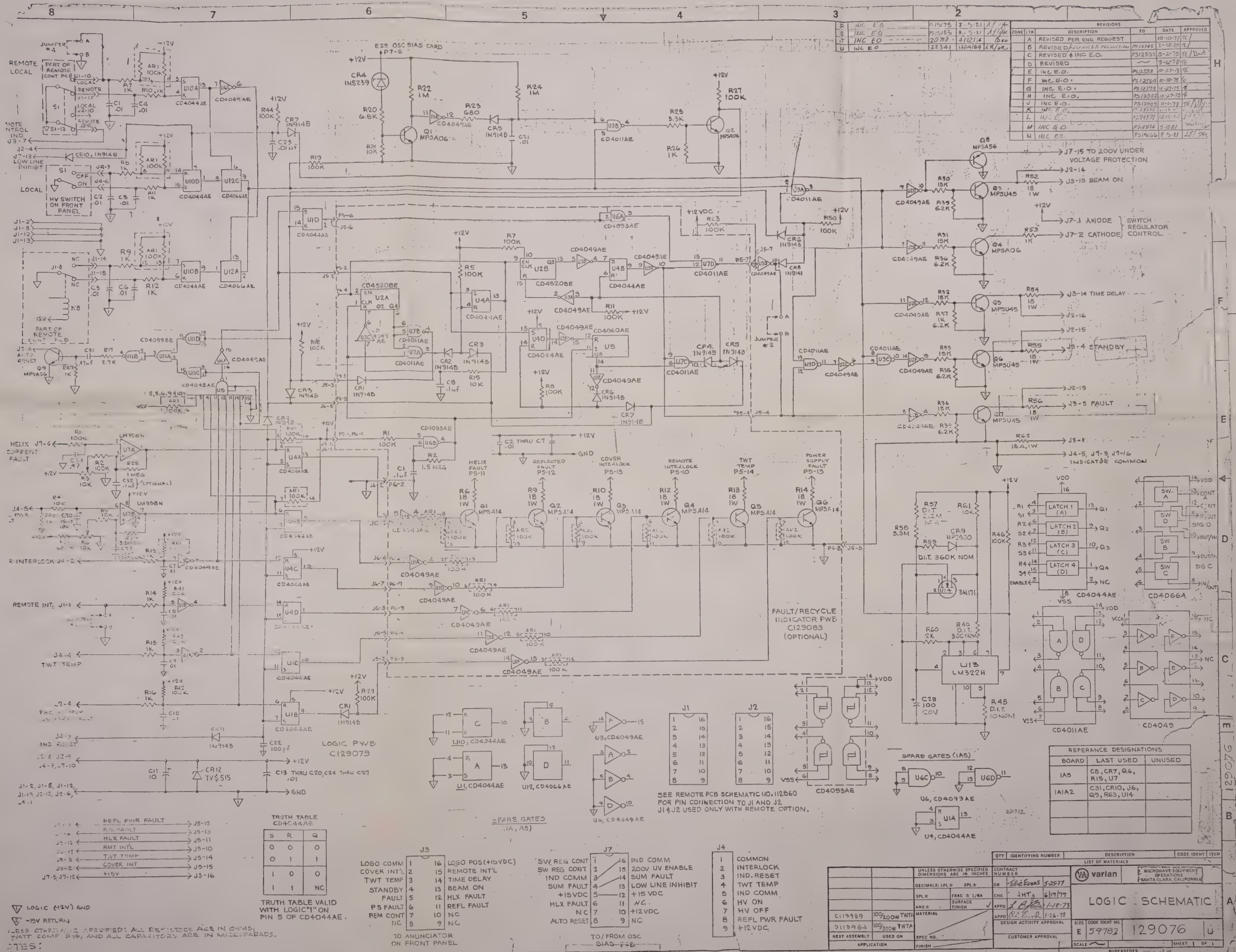
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|--------------------------------------------------------------------------------------------------|--|---------------------------------------|--------------|------------------------------|-------------------|-----------|---------|----------|
|  <b>varian</b> |  | <b>MICROWAVE EQUIPMENT OPERATIONS</b> |              | TITLE: ASSEMBLY, FRONT PANEL |                   | LM 129054 | REV E   |          |
| CODE IDENT NO. 99313                                                                             |  | APPROVAL <i>PSA</i>                   | DATE 10-1-77 | 0408A                        |                   |           |         |          |
| REVISION                                                                                         |  |                                       |              |                              |                   |           |         |          |
| APPLICATION                                                                                      |  |                                       |              |                              |                   |           |         |          |
| NEXT ASSEMBLY                                                                                    |  | USED ON                               | EO           | REV                          | DESCRIPTION       | EO        | DATE    | APPROVED |
| E113573                                                                                          |  | 100-200W TWTA                         | PS12345      | A                            | REL TO NFR        | PS12345   | 1-20-78 | K.R.     |
|                                                                                                  |  |                                       |              | B                            | CHANGE ON DRAWING | PS12353   | 1-24-78 | K.R.     |
|                                                                                                  |  |                                       |              | C                            | ADD -01 OPTION    | PS12446   | 3-7-79  | K.R.     |
|                                                                                                  |  |                                       |              | D                            | ADD -02 OPTION    | PS12516   | 5-26-78 | K.R.     |
|                                                                                                  |  |                                       |              | E                            | ADD -03 OPTION    | PS12614   | 5-26-78 | K.R.     |
| REVISION STATUS                                                                                  |  |                                       |              |                              |                   |           |         |          |
| SHEET                                                                                            |  |                                       |              |                              |                   |           |         |          |
| LTR                                                                                              |  |                                       |              |                              |                   |           |         |          |
| SHEET                                                                                            |  |                                       |              |                              |                   |           |         |          |
| LTR                                                                                              |  |                                       |              |                              |                   |           |         |          |
| SHEET                                                                                            |  |                                       |              |                              |                   |           |         |          |
| LTR                                                                                              |  |                                       |              |                              |                   |           |         |          |



FOIPA 1758 (12 375







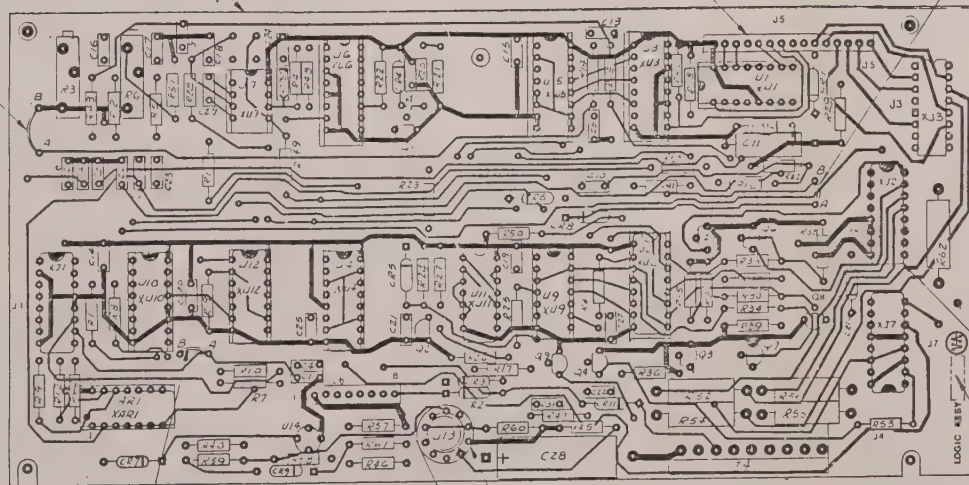
|   |          |       |          | REVISIONS |     |                         |         |          |          |
|---|----------|-------|----------|-----------|-----|-------------------------|---------|----------|----------|
|   |          |       |          | ZONE      | LTR | DESCRIPTION             | EO      | DATE     | APPROVED |
| P | INC E.O. | 21575 | 7-5-71   | A         |     |                         |         |          |          |
| Q | INC E.O. | 21575 | 8-5-71   | A         |     |                         |         |          |          |
| R | INC E.O. | 2072  | 4/12/74  | B         |     |                         |         |          |          |
| U | INC E.O. | 22341 | 12/14/84 | A         |     |                         |         |          |          |
|   |          |       |          | A         |     | REVISED PER ENG REQUEST |         | 10-10-77 | TE       |
|   |          |       |          | B         |     | REVISED PER ENG REQUEST | PS12345 | 1-16-78  | TE       |
|   |          |       |          | C         |     | REVISED & INC E.O.      | PS12537 | 3-2-79   | TE/DN    |
|   |          |       |          | D         |     | REVISED                 |         | 3-2-78   | TE       |
|   |          |       |          | E         |     | INC E.O.                | PS1558  | 8-27-78  | TE       |
|   |          |       |          | F         |     | INC E.O.                | PS12564 | 8-27-78  | TE       |
|   |          |       |          | G         |     | INC E.O.                | PS12578 | 8-27-78  | TE       |
|   |          |       |          | H         |     | INC E.O.                | PS12608 | 8-27-78  | TE       |
|   |          |       |          | J         |     | INC E.O.                | PS12695 | 8-27-78  | TE/DN    |
|   |          |       |          | K         |     | INC E.O.                | PS13192 | 8-27-78  | TE/DN    |
|   |          |       |          | L         |     | INC E.O.                | PS14471 | 12-15-80 | TE/DN    |
|   |          |       |          | M         |     | INC E.O.                | PS14974 | 5-11-81  | TE/DN    |
|   |          |       |          | N         |     | INC E.O.                | PS15166 | 8-5-81   | TE/DN    |

| REFERENCE DESIGNATIONS |                                |        |
|------------------------|--------------------------------|--------|
| BOARD                  | LAST USED                      | UNUSED |
| 1A5                    | C8, CR7, Q6,<br>R15, U7        |        |
| 1A1A2                  | C31, CR10, J6,<br>Q9, R63, U14 |        |
|                        |                                |        |
|                        |                                |        |
|                        |                                |        |

|                                                                                        |  |                                                                             |  |                                                                                                     |  |                                                                                                                                                 |  |
|----------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                        |  | QTY IDENTIFYING NUMBER                                                      |  | DESCRIPTION                                                                                         |  | CODE IDENT ITEM                                                                                                                                 |  |
|                                                                                        |  | LIST OF MATERIALS                                                           |  |                                                                                                     |  |                                                                                                                                                 |  |
|                                                                                        |  | CONTRACT NUMBER                                                             |  |  <b>varian</b> |  |  MICROFILM EQUIPMENT OPERATIONS<br>SANTA CLARA, CALIFORNIA |  |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES                                 |  | DR <i>1112 Express</i> 5-25-77<br>3PL ± FRAC ± 1/64<br>ANG ± SURFACE FINISH |  | CKD <i>JHT</i> 6/17/77<br>APPD <i>2 B. Jones</i> 1-18-78<br>APPD <i>R. E. R</i> 1-26-78             |  | LOGIC SCHEMATIC                                                                                                                                 |  |
| MATERIAL                                                                               |  | SPEC NO. _____<br>APPLICATION _____<br>FINISH _____                         |  | DESIGN ACTIVITY APPROVAL<br>CUSTOMER APPROVAL _____<br>SCALE _____                                  |  | SIZE CODE IDENT NO.<br><b>E 59782</b>                                                                                                           |  |
| 113989 100% 200W TWTA<br>113984 100% 200W TWTA<br>NEXT ASSEMBLY USED ON<br>APPLICATION |  | 129076                                                                      |  | SHEET 1 OF 1                                                                                        |  | SUPENSEDER <i>11/11/77</i>                                                                                                                      |  |







22 68  
JPR 82  
4

25  
68  
FARSIDE  
3 PLCS  
JPRG  
JPR7  
JPRB  
REMOVE  
SOCKET X72,  
ADD C3P-C36  
DETAIL "A"  
-03 VERSION ONLY

FOR -03 VERSION  
SEE DETAIL "A"



| REVISIONS |     | EO                  | DATE   | APPROVED |
|-----------|-----|---------------------|--------|----------|
| ZONE      | LTR | DESCRIPTION         |        |          |
| 2         |     | REVISED AND REDRAWN | PSM979 | 5/18/81  |
| 2         |     | INC. E.O.           | PS1566 | 8-5-81   |
| 7         |     | INC. E.O.           | PS1575 | 8-5-81   |
| U         |     | INC. E.O.           | PS1525 | 8-5-81   |
| V         |     | INC. E.O.           | 15333  | 9-23-81  |
| W         |     | PICTURE CHANGE      | PS1515 | 10/26/81 |
| Y         |     | INC. E.O.           | 19529  | 10/14/81 |
| XA        |     | INC. E.O.           | 20120  | 1-16-82  |
| XB        |     | INC. E.O.           | 20519  | 2-21-82  |
| AC        |     | INC. E.O.           | 20025  | 3-2-82   |
| AD        |     | INC. E.O.           | 1372   | 4-1-82   |
| AE        |     | INC. E.O.           | 20712  | 4-1-82   |
| AF        |     | INC. E.O.           | 2126   | 5-2-82   |
| AG        |     | INC. E.O.           | 21835  | 7-24-82  |
| AH        |     | INC. E.O.           | 22035  | 10-2-82  |
| AJ        |     | INC. E.O.           | 22172  | 12-13-82 |
| AK        |     | INC. E.O.           | 22341  | 12/14/82 |
| AL        |     | INC. E.O.           | 22502  | 1-11-83  |
| AM        |     | INC. E.O.           | 22675  | 1-21-83  |
| AN        |     | INC. E.O.           | 23337  | 1-4-83   |
| AP        |     | INC. E.O.           | 23704  | 4-15-83  |
| AR        |     | INC. E.O.           | 24042  | 5-5-83   |

5. CONFORMAL COAT PER 01006342 - 01 ONLY  
 4. SEE LM FOR USAGE OF JUMPERS  
 3. MOUNT SHORT PINS IN PCB FOR J5 & J6  
 2. MARK WITH CURRENT P/N & REVISION LETTER.  
 1. ASSEMBLE/ARIAN MODERNIZATION STD. 87-800299.  
 NOTES: UNLESS OTHERWISE SPECIFIED.

SEE SEPARATE LIST OF MATERIAL - LM129079

| QTY                                                    | IDENTIFYING NUMBER | DESCRIPTION              | CODE IDENT    | ITEM |
|--------------------------------------------------------|--------------------|--------------------------|---------------|------|
| LIST OF MATERIALS                                      |                    |                          |               |      |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES |                    | CONTRACT NUMBER          |               |      |
| DECIMALS: 3PL ± 1 2PL ± 0.01                           | OR                 | F-15-81                  |               |      |
| 3PL ± 0.01                                             | FRAC ± 1/64        | CHK                      | S. G. 5-11-81 |      |
| ANG ± 1°                                               | SURFACE FINISH     | APPRO                    | 5/17/81       |      |
| MATERIAL                                               |                    | DESIGN ACTIVITY APPROVAL |               |      |
| NEXT ASSEMBLY                                          |                    | CUSTOMER APPROVAL        |               |      |
| APPLICATION                                            |                    | FINISH                   |               |      |
| SPEC NO                                                |                    | SCALE ZX                 |               |      |
| 100/200K<br>7M 72                                      |                    | CODE IDENT NO            |               |      |
|                                                        |                    | D 59782 129079           |               |      |
|                                                        |                    | CLASS: A                 |               |      |
|                                                        |                    | SHEET 1 OF 1             |               |      |

varian MICROWAVE EQUIPMENT DIVISION  
SANTA CLARA, CALIFORNIA  
ASSEMBLY  
LOGIC PCB



















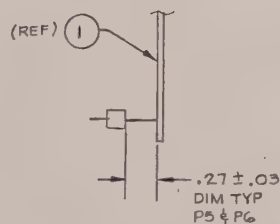
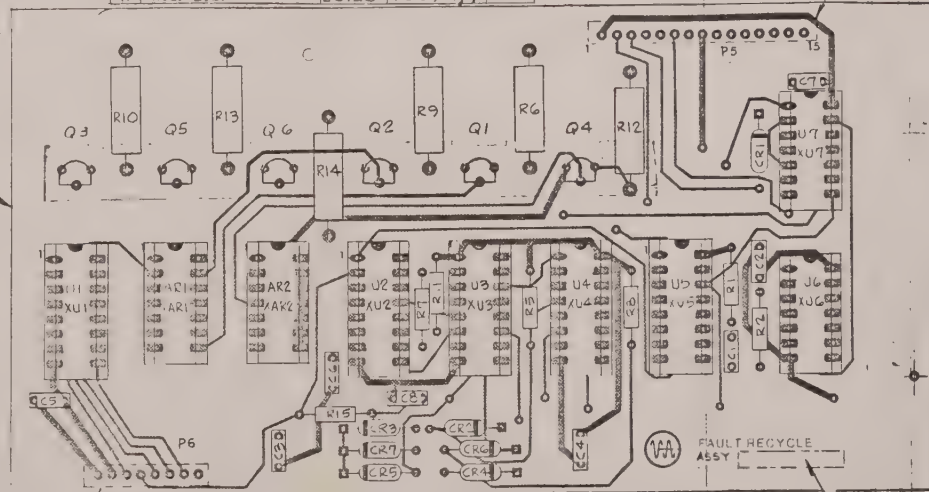








| 4 |           |       |          | 3  |           |         |          | 2  |           |                                |          | 1         |          |  |  |
|---|-----------|-------|----------|----|-----------|---------|----------|----|-----------|--------------------------------|----------|-----------|----------|--|--|
| J | INC. E.O. | 21262 | 10-25-80 | 14 | INC. E.O. | PS12517 | 10-27-78 | 15 | INC. E.O. | PS12555                        | 10-27-78 | REVISIONS |          |  |  |
| K | INC. E.O. | 21801 | 9-24-84  | 15 | INC. E.O. | PS13045 | 3-19-79  | WF | REVISION  | DESCRIPTION                    | EQ       | DATE      | APPROVED |  |  |
| L | INC. E.O. | 24337 | 11-4-85  | 16 | INC. E.O. | PS14976 | 3-11-81  | 20 | A         | REVISED/RELEASED TO PRODUCTION | PS12345  | 11/11/78  | JHT      |  |  |
| M | INC. E.O. | 26042 | 5-6-86   | 17 | INC. E.O. | PS14974 | 6-31-81  | 21 |           |                                |          |           |          |  |  |
|   |           |       |          |    | INC. E.O. | PS15164 | 4-10-81  | 22 |           |                                |          |           |          |  |  |
|   |           |       |          |    | INC. E.O. | 20728   | 4-3-84   | 23 |           |                                |          |           |          |  |  |



DETAIL "A"

SEE SEPARATE LIST OF MATERIAL - LM129083

| QTY                                                 |  | IDENTIFYING NUMBER       |  | DESCRIPTION       |  | CODE IDENT                   |  | ITEM                    |  |
|-----------------------------------------------------|--|--------------------------|--|-------------------|--|------------------------------|--|-------------------------|--|
| CONTRACT NUMBER                                     |  | LIST OF MATERIALS        |  | VARIAN            |  | MICROWAVE EQUIPMENT DIVISION |  | SANTA CLARA, CALIFORNIA |  |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |  | CONTRACT NUMBER          |  | DR                |  | 1/4/78                       |  | 1/4/78                  |  |
| DECIMALS: 1PL ± .1 2PL ± .02                        |  | CHK                      |  | 1/4/78            |  | 1/4/78                       |  | 1/4/78                  |  |
| 3PL ± .005                                          |  | ANG ± 1°                 |  | APPD              |  | 1/4/78                       |  | 1/4/78                  |  |
| FRAC ± 1/64                                         |  | SURFACE FINISH           |  | APPD              |  | 1-26-78                      |  | 1-26-78                 |  |
| MATERIAL                                            |  | DESIGN ACTIVITY APPROVAL |  | CUSTOMER APPROVAL |  | SCALE 2X                     |  | CLASS: A                |  |
| E113979                                             |  | 100/200 TWT              |  | SPEC NO           |  | C 59782                      |  | 129083                  |  |
| NEXT ASSEMBLY                                       |  | USED ON                  |  | APPLICATION       |  | FINISH                       |  | SHEET 1 OF 1            |  |

4. CONFORMAL COAT PER 01006342 -01 ONLY

3 J5 & J6 MOUNTED ON FAR SIDE, SEE DETAIL "A"

2 MARK WITH CURRENT P/N & REVISION LETTER.

1. ASSEMBLY/VARIAN WORKMANSHIP STD. 87-800-299.

NOTES: UNLESS OTHERWISE SPECIFIED



|                                                                                    |  |                                |  |                 |  |                               |  |                                |  |         |  |          |  |          |  |
|------------------------------------------------------------------------------------|--|--------------------------------|--|-----------------|--|-------------------------------|--|--------------------------------|--|---------|--|----------|--|----------|--|
|  |  | MICROWAVE EQUIPMENT OPERATIONS |  | TITLE           |  | ASSEMBLY, FLT/RECYCLE/IND PWB |  | LM 129083                      |  | REV M   |  |          |  |          |  |
| CODE IDENT NO<br>59782                                                             |  | APPROVAL<br>J. Steck           |  | DATE<br>6/20/77 |  | R.G. Lund 1-26/78             |  |                                |  | 0411A   |  |          |  |          |  |
| APPLICATION                                                                        |  |                                |  | REVISION        |  |                               |  |                                |  |         |  |          |  |          |  |
| NEXT ASSEMBLY                                                                      |  | USED ON                        |  | EO              |  | REV                           |  | DESCRIPTION                    |  | EO      |  | DATE     |  | APPROVED |  |
| E113979                                                                            |  | 100/200 TWTA                   |  |                 |  | A                             |  | REVISED AND RET. TO PRODUCTION |  | PS12345 |  | 1/10/78  |  | JHT      |  |
|                                                                                    |  |                                |  |                 |  | B                             |  | INC. E.O.                      |  | PS12517 |  | 10/30/78 |  | MHS      |  |
|                                                                                    |  |                                |  |                 |  | C                             |  | INC. E.O.                      |  | PS12565 |  | 10/30/78 |  | MHS      |  |
|                                                                                    |  |                                |  |                 |  | D                             |  | INC. E.O.                      |  | PS13295 |  | 12/19/79 |  | WF/KR    |  |
|                                                                                    |  |                                |  |                 |  | E                             |  | INC. E.O.                      |  | PS14976 |  | 3/11/81  |  | JD       |  |
|                                                                                    |  |                                |  |                 |  | F                             |  | INC. E.O.                      |  | PS14974 |  | 5/14/81  |  | ?        |  |
|                                                                                    |  |                                |  |                 |  | G                             |  | INC. E.O.                      |  | PS15184 |  | 8/10/81  |  | AN       |  |
|                                                                                    |  |                                |  |                 |  | H                             |  | INC. E.O.                      |  | 20728   |  | 4/2/84   |  | JR/JK    |  |
|                                                                                    |  |                                |  |                 |  | J                             |  | INC. E.O.                      |  | 21266   |  | 6/23/84  |  | SN/ML    |  |
|                                                                                    |  |                                |  |                 |  | K                             |  | INC. E.O.                      |  | 21881   |  | 9/24/84  |  | JR/ML    |  |
|                                                                                    |  |                                |  |                 |  | L                             |  | INC. E.O.                      |  | 24337   |  | 11/4/85  |  | SN/ML    |  |
|                                                                                    |  |                                |  |                 |  | M                             |  | INC. E.C.O.                    |  | 26042   |  | 5/6/86   |  | SN/ML    |  |

|                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| REVISION STATUS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



| varian  |          | MICROWAVE EQUIPMENT<br>OPERATIONS  | ASSEMBLY, FLT/RECYCLE/IND PWB |               | LM 129083         | REV<br>M                        |
|---------|----------|------------------------------------|-------------------------------|---------------|-------------------|---------------------------------|
| ITEM NO | REF DES  | DESCRIPTION                        | VARIAN PART NO                | MFG           | MFG OR MS PART NO | QTY/DASH NO.<br>-00 -01 -02 -03 |
| 1       |          | FABRICATION PWB                    | 129082                        |               |                   | 1 1                             |
| 2       |          | SCHEMATIC                          | 129076                        |               |                   | R R                             |
| 3       |          |                                    |                               |               |                   |                                 |
| 4       | C2-7     | CAPACITOR, CERAMIC, .01uf, 200V    | 41-229951                     |               | CK06BX103K        | 6 6                             |
| 5       | C1,8     | CAPACITOR, CERAMIC, .1uf, 100V     | 41-229952                     |               | CK06BX104K        | 2 2                             |
| 6       | CR1-7    | DIODE, SIGNAL                      | 66-320914                     |               | 1N914B            | 7 7                             |
| 7       |          |                                    |                               |               |                   |                                 |
| 8       |          |                                    |                               |               |                   |                                 |
| 9       | Q1-6     | TRANSISTOR, NPN                    | 62-920006                     | MOT           | MPS-A14           | 6 6                             |
| 10      | R15      | RESISTOR, COMP., 10K, 1/4W, 5%     | 32-301510                     |               | RC07GF103J        | 1 1                             |
| 11      | R1,5,7,  | RESISTOR, COMP., 100K, 1/4W, 5%    | 32-301610                     |               | RC07GF104J        | 5 5                             |
|         | R8,11    |                                    |                               |               |                   |                                 |
| 12      | R2       | RESISTOR, COMP., 1.5 MEG, 1/4W, 5% | 32-301715                     |               | RC07GF155J        | 1 1                             |
| 13      | R6,9,10, | RESISTOR, COMP., 18 OHM, 1W, 5%    | 33-301218                     |               | RC32GF180J        | 6 6                             |
|         | R12-14   |                                    |                               |               |                   |                                 |
| 14      | AR1,2    | RESISTOR, NETWORK, 100K            | 31-400023                     | ALLEN-BRADLEY | 314B104           | 2 2                             |
| 15      |          |                                    |                               |               |                   |                                 |
| 16      |          |                                    |                               |               |                   |                                 |
| 17      |          |                                    |                               |               |                   |                                 |
| 18      | U1,3     | I.C.-HEX BUFFER/INVERTER           | 62-600032                     | RCA           | CD4049AE          | 2 2                             |
| 19      | U2       | I.C.-DUAL BINARY UP-COUNTER        | 62-600691                     | RCA           | CD4520BE          | 1 1                             |













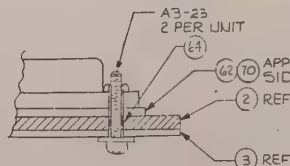
| REVISIONS |     |                                |              |          |         |
|-----------|-----|--------------------------------|--------------|----------|---------|
| ZONE      | LTR | DESCRIPTION                    | ED           | DATE     | APPROVE |
| 7         |     | PER EO'S P512243, P512510      | 2-28-77      |          |         |
|           |     | P512977, P512666               | P51268       | 5-2-77   |         |
|           |     | H RE DESIGNED PER EO           | P513876      | 7-8-80   |         |
|           |     | T REWASER                      | P513876      | 8-2-80   |         |
|           |     | K INC E.O.                     | P513876      | 10-11-80 |         |
|           |     | M INC EO'S 14902, 14981, 14990 | 51412-11     | 11-11-80 |         |
|           |     | P INC E.O. 14982               | 51412-11     | 11-11-80 |         |
|           |     | R INC E.O.                     | P515245      | 7-1-81   |         |
|           |     | T INC. E.O.                    | 15305        | 9-23-81  |         |
|           |     | U INC E.O.                     | 15547, 15550 | 11-11-81 |         |
|           |     | V INC E.O.                     | 18337        | 3-28-83  |         |
|           |     | Y INC E.O.                     | 18705        | 5-19-83  |         |
|           |     | AA INC E.O.                    | 204579       | 3-7-84   |         |
|           |     | AB INC E.O.                    | 22055        | 11-26-84 |         |
|           |     | AC INC E.O.                    | 23446        | 3-18-85  |         |
|           |     | AD INC E.O.                    | 23482        | 10-20-85 |         |
|           |     | AE INC E.O.                    | 20042        | 5-5-86   |         |
|           |     | AF INC E.O.                    | 20160        | 10-1-87  |         |

SEE DETAIL  
A FOR -00



DETAIL A

B2-03  
2 PLCS



DETAIL A-A  
TYP T PLCS

- 7 L.E.D. MUST BE BENT PARALLEL TO BOARD.  
6. CONFORMAL COAT PER D1006342 -02 ONLY  
5 WIRE TO BK-1, RED-2, ORN-3.  
4 JUMPER A-B NOT REQUIRED, REFERENCE ONLY.  
(USE JUMPER A-B FOR 8A HEATER SURGE CURRENT LIMIT).  
3 MARK WITH CURRENT ASSY REV LETTER & DASH N°.  
2. ASSEMBLE USING HARDWARE PER DWG NO. 110625.

NOTES: 1 ASSEMBLE PER VARIAN WORKMANSHIP STD 87-800299.

SEE SEPARATE LIST OF MATERIALS - LM129405

| QTY                      | IDENTIFYING NUMBER | DESCRIPTION                    | CODE IDENT | ITEM     |
|--------------------------|--------------------|--------------------------------|------------|----------|
| LIST OF MATERIALS        |                    |                                |            |          |
| CONTRACT NUMBER          |                    | VARIAN                         |            |          |
| DR                       |                    | MICROWAVE EQUIPMENT OPERATIONS |            |          |
| CHR                      |                    | SANTA CLARA, CALIFORNIA        |            |          |
| APPR                     |                    | ASSEMBLY                       |            |          |
| DESIGN ACTIVITY APPROVAL |                    | HV CONVERT/HTR SUPPLY          |            |          |
| CUSTOMER APPROVAL        |                    | SCALE 2/1 CLASS A              |            |          |
| SIZE                     |                    | CODE IDENT NO                  |            | 129405   |
| D                        |                    | 59782                          |            | AF       |
| APPLICATION              |                    | FINISH                         |            | SHEET OF |
| SUPERSEDES               |                    | REVISION                       |            |          |

|                                                        |  |                          |          |        |        |
|--------------------------------------------------------|--|--------------------------|----------|--------|--------|
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES |  | CONTRACT NUMBER          | DR       | LLAPIN | 7-1-80 |
| DECIMALS 1/16 1/32 1/64                                |  | CHR                      | JAMES W. | 7-9-80 |        |
| AND 3/16 SURFACE FINISH                                |  | APPR                     | 5/2/80   | 3/3/80 |        |
| MATERIAL                                               |  | DESIGN ACTIVITY APPROVAL |          |        |        |
| NEXT ASSEMBLY                                          |  | CUSTOMER APPROVAL        |          |        |        |
| E113979                                                |  | 100% POWER               |          |        |        |
| USED ON                                                |  | SPEC NO.                 |          |        |        |
| APPLICATION                                            |  | FINISH                   |          |        |        |





|                     |  |                                |  |                                  |  |                  |  |                           |  |
|---------------------|--|--------------------------------|--|----------------------------------|--|------------------|--|---------------------------|--|
| varian              |  | MICROWAVE EQUIPMENT OPERATIONS |  | TITLE: H. V. INPUT CONVERTER PCB |  | LM 129405        |  | REV AF                    |  |
| CODE IDENT NO 59782 |  | APPROVAL                       |  | DATE                             |  |                  |  | 0409A                     |  |
| APPLICATION         |  | REVISION                       |  |                                  |  |                  |  |                           |  |
| NEXT ASSEMBLY       |  | USED ON                        |  | EO                               |  | DATE             |  | APPROVED                  |  |
| E113979             |  | R-47                           |  | AC                               |  | 23402, INC. E.O. |  | 23446 5/18/85 JK/ML       |  |
|                     |  |                                |  | AD                               |  | INC. E.O.        |  | 24682 10/30/85 ML         |  |
|                     |  |                                |  | AE                               |  | INC. E.C.O.      |  | 26042 5/5/86 SN <i>dx</i> |  |
|                     |  |                                |  | AF                               |  | INC ECO          |  | 28160 6/1/87 <i>EC/A</i>  |  |

| REVISION STATUS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LTR             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



| varian  |                     | MICROWAVE EQUIPMENT OPERATIONS   | H. V. INPUT CONVERTER PCB | LM 129405 |                   | REV AF                         |
|---------|---------------------|----------------------------------|---------------------------|-----------|-------------------|--------------------------------|
| ITEM NO | REF DES             | DESCRIPTION                      | VARIAN PART NO            | MFG       | MFG OR MS PART NO | QTY/DASH NO<br>-00 -01 -02 -03 |
| 1       |                     | SCHEMATIC                        | D129402                   |           |                   | R - -                          |
| 2       |                     | HEATSINK                         | D135878                   |           |                   | 1 1 1                          |
| 3       |                     | FABRICATION, PCB                 | D129404                   |           |                   | 1 1 1                          |
| 4       |                     | SCHEMATIC                        | D135845                   |           |                   | - R R                          |
| 5       | C1,12               | CAPACITOR, CERAMIC, 1uf, 50V     | 41-229936                 |           | CK06BX105K        | 2 2 2                          |
| 6       | C2                  | CAPACITOR, CERAMIC, 100 pf, 200V | 41-229960                 |           | CK05BX101K        | 1 1 1                          |
| 7       | C4-7,9              | CAPACITOR, CERAMIC, .1uf, 100V   | 41-229952                 |           | CK06BX104K        | 5 5 5                          |
| 8       | C8                  | CAPACITOR, CERAMIC, .01uf, 200V  | 41-229951                 |           | CK06BX103K        | 1 1 1                          |
| 9       | C10,11              | CAPACITOR, ALUM., 8.2 uf, 150V   | 41-506114                 | SPRAGUE   | 600D825F1500D4    | 2 2 2                          |
| 10      | CR27                | DIODE, 20V, 5W                   | 66-304965                 | UNITRODE  | 1N4965            | 1 1 1                          |
| 11      | CR24,25             | DIODE, 75V, 5W, 10%              | 66-393016                 | UNITRODE  | UZ4875            | 2 2 2                          |
| 12      | CR23                | DIODE                            | 66-310751                 |           | 1N751-            | 1 1 1                          |
| 13      | CR1-4,5,<br>7,10,16 | DIODE                            | 66-304936                 |           | 1N4936            | 8 8 8                          |
| 14      |                     |                                  |                           |           |                   |                                |
| 15      | CR13                | DIODE, LED, RED                  | 67-499834                 | MONSANTO  | MV5752            | 1 1 1                          |
| 16      | CR14                | SCR                              | 66-600088                 |           | 2N5064            | 1 1 1                          |
| 17      | CR15                | UNIJUNCTION                      | 62-906119                 | UNITRODE  | 2N6119            | 1 1 1                          |
| 18      | CR26                | DIODE                            | 66-314746                 |           | 1N4746A           | 1 1 1                          |
| 19      | CR17                | SILICON BRIDGE                   | 66-235012                 | VARO      | VE-18X            | 1 1 1                          |
| 20      | CR22,18-20          | DIODE                            | 66-320914                 |           | 1N914B            | 4 4 4                          |



| varian  |         | MICROWAVE EQUIPMENT OPERATIONS     | H. V. INPUT CONVERTER PCB |          | LM 129405         | REV AF          |
|---------|---------|------------------------------------|---------------------------|----------|-------------------|-----------------|
| ITEM NO | REF DES | DESCRIPTION                        | VARIAN PART NO            | MFG      | MFG OR MS PART NO | QTY/DASH NO     |
|         |         |                                    |                           |          |                   | -00 -01 -02 -03 |
| 21      | CR21    | DIODE                              | 66-310758                 |          | 1N758A            | 1 1 1           |
| 22      | J1      | CONNECTOR, 6 PIN                   | 51-407151                 | MOLEX    | 09-75-1061        | 1 1 1           |
| 23      | J3      | CONNECTOR, 12 PIN                  | 51-407156                 | MOLEX    | 09-75-1128        | 1 - -           |
| 24      | L1-L4   | INDUCTOR                           | C057664                   |          |                   | 4 4 4           |
| 25      | J3      | CONNECTOR, 16 PIN                  | 51-411007                 |          | 09-75-1161        | - 1 1           |
| 26      | Q5,6    | TRANSISTOR                         | 62-920019                 |          | MPSA56            | 2 2 2           |
| 27      | Q2      | TRANSISTOR                         | 62-798003                 |          | D44H11            | 1 1 1           |
| 28      | Q3,Q1   | TRANSISTOR                         | 62-920018                 |          | MPSA06            | 2 2 2           |
| 29      | Q4      | TRANSISTOR                         | 62-990211                 |          | MJ-1000           | 1 1 1           |
| 30      | Q7-10   | TRANSISTOR                         | 62-990175                 | MOTOROLA | MJ-10004          | 4 4 4           |
| 31      | Q11,12  | TRANSISTOR                         | 62-906254                 |          | 2N6254            | 2 2 2           |
| 32      |         |                                    |                           |          |                   |                 |
| 33      | R1      | RESISTOR, COMP 430 OHM, 5%, 1/2W   | 32-201343                 |          | RC20GF431J        | 1 1 1           |
| 34      | R3      | RESISTOR, VARIABLE, 10K            | 36-792215                 | BOURNS   | 3006P-1-103       | 1 1 1           |
| 35      | R2      | RESISTOR, COMP, 100K, 5%, 1/4W     | 32-301610                 |          | RC07GF104J        | 1 1 1           |
| 36      | R4      | RESISTOR, COMP., 33.2K, +1%, 1/4W  | 31-225332                 |          | RC07GF333J        | 1 1 1           |
| 37      | R5      | RESISTOR, COMP., 2K, 5%, 1/4W      | 32-301420                 |          |                   | 1 1 1           |
| 38      | R6,7,36 | RESISTOR, COMP., 100 OHM, 5%, 1/4W | 32-301310                 |          | RC07GF101J        | 3 3 3           |
| 39      | R8,9,33 | RESISTOR, COMP., 3.3K, 5%, 1/4W    | 32-301433                 |          | RC07GF332J        | 3 3 3           |
| 40      | R10     | RESISTOR, COMP., 15K, 5%, 1/4W     | 32-301515                 |          | RC07GF153J        | 1 1 1           |
| 41      | R11     | RESISTOR, COMP., 4.7K, 5%, 1/4W    | 32-301447                 |          | RC07GF472J        | 1 1 1           |





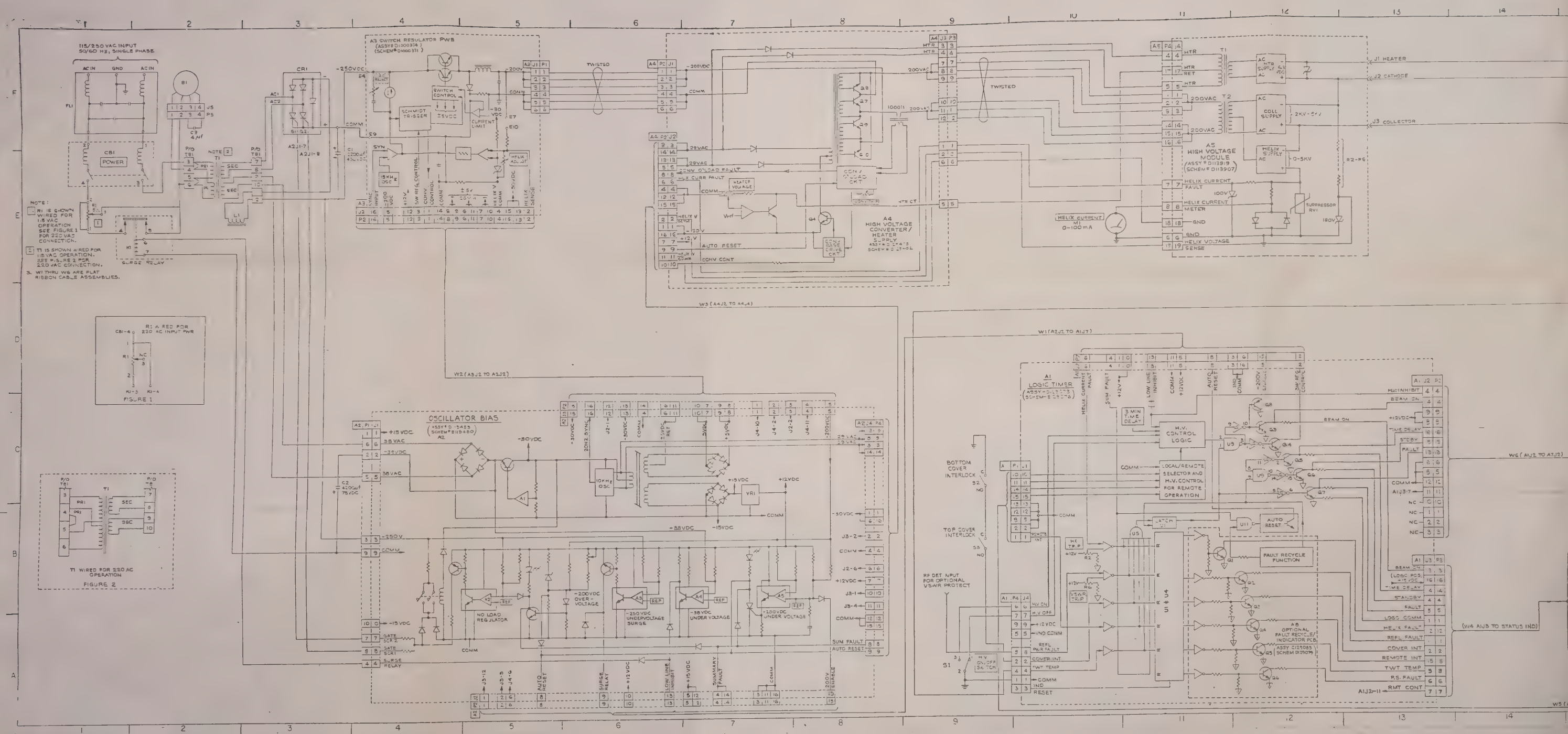
| varian  |                   | MICROWAVE EQUIPMENT OPERATIONS     | H. V. INPUT CONVERTER PCB |               | LM 129405          |             | REV AF |         |
|---------|-------------------|------------------------------------|---------------------------|---------------|--------------------|-------------|--------|---------|
| ITEM NO | REF DES           | DESCRIPTION                        | VARIAN PART NO.           | MFG           | MFG OR MS PART NO. | QTY/DASH NO |        |         |
|         |                   |                                    |                           |               |                    | -00         | -01    | -02 -03 |
| 42      | R12,13,31         | RESISTOR, COMP., 33K, 5%, 1/4W     | 32-301533                 |               | RC07GF333J         | 3           | 3      | 3       |
| 43      | R14,16            | RESISTOR, COMP., 1K, 5%, 1/4W      | 32-301410                 |               | RC07GF102J         | 2           | 2      | 2       |
| 44      | R15               | RESISTOR, M.F., 1K, .1%, 1/4W      | 31-604100                 |               |                    | 1           | 1      | 1       |
| 45      | R38               | RESISTOR, COMP., 27K, 5%, 1/4W     | 32-301527                 |               | RC07GF513J         | -           | 1      | 1       |
| 46      | R18               | RESISTOR, VARIABLE, 2K             | 36-792211                 | BOURNS        | 3006P-1-202        | 1           | 1      | 1       |
| 47      | R19               | RESISTOR, M.F., 249 OHM, 1%, 1/4W  | 31-603249                 |               |                    | 1           | 1      | 1       |
| 48      | R20,21,<br>R24,25 | RESISTOR, W.W., 2 OHM, 1%, 3-1/4W  | 35-199119                 | OHMITE        | 4337               | 4           | 4      | 4       |
| 49      | R22,23            | RESISTOR, COMP., 100K, 5%, 1/2W    | 32-201610                 |               | RC20GF104J         | 2           | 2      | 2       |
| 50      | R26-29            | RESISTOR, COMP., 56 OHM, 5%, 1/2W  | 32-201256                 |               | RC20GF560J         | 4           | 4      | 4       |
| 51      | R30               | RESISTOR, W.W., 0.15 OHM, 10%      | 35-199131                 |               |                    | 1           | 1      | 1       |
| 52      | R32               | RESISTOR, COMP., 100 OHM, 5%, 1/4W | 32-301310                 |               | RC07GF101J         | 1           | 1      | 1       |
| 53      | R34,35            | RESISTOR, W.W., 0.5 OHM, 3%        | 35-286050                 |               |                    | 2           | 2      | 2       |
| 54      |                   |                                    |                           |               |                    |             |        |         |
| 55      | T1                | TRANSFORMER                        | C057661                   |               |                    | 1           | 1      | 1       |
| 56      | T2                | TRANSFORMER                        | C057660                   |               |                    | 1           | 1      | 1       |
| 57      |                   |                                    |                           |               |                    |             |        |         |
| 58      | U1                | I.C., POWER REGULATOR VOLTAGE      | 62-600500                 |               | UA723              | 1           | 1      | 1       |
| 59      |                   |                                    |                           |               |                    |             |        |         |
| 60      | J2                | SOCKET, 16 PIN                     | 54-634023                 | CKT ASSY CORP | 16S-105D           | 1           | 1      | 1       |
| 61      | JPR-C-D           | JUMPER - #20 AWG (USE ITEMS 71&72) |                           |               |                    | 1           | -      | -       |



| varian  |         | MICROWAVE EQUIPMENT OPERATIONS        | H. V. INPUT CONVERTER PCB |                | LM 129405         | REV AF       |     |         |
|---------|---------|---------------------------------------|---------------------------|----------------|-------------------|--------------|-----|---------|
| ITEM NO | REF DES | DESCRIPTION                           | VARIAN PART NO            | MFG            | MFG OR MS PART NO | QTY/DASH NO. |     |         |
|         |         |                                       |                           |                |                   | -00          | -01 | -02 -03 |
| 62      |         | INSULATOR, T03 TRANSISTOR             | 62-898002                 | UNION CARBIDE  | H-4001            | 7            | 7   | 7       |
| 63      |         |                                       |                           |                |                   |              |     |         |
| 64      |         | BUSHING (3/16" LONG NYLON)            | 22-420029                 | AMATOM         | 9223-N-140        | 14           | 14  | 14      |
| 65      |         |                                       |                           |                |                   |              |     |         |
| 66      |         | TOROID RETAINER #10-32                | 43-900002                 | DELBERT BLINN  | 100-6             | 1            | 1   | 1       |
| 67      |         | TOROID RETAINER #6-32                 | 43-900001                 | DELBERT BLINN  | 100-3             | 1            | 1   | 1       |
| 68      |         |                                       |                           |                |                   |              |     |         |
| 69      |         |                                       |                           |                |                   |              |     |         |
| 70      |         | THERMAL COMPOUND                      | 88-298900                 | WAKEFIELD      | 120-8             | AR           | AR  | AR      |
| 71      |         | WIRE, UNINSUL., COPPER #20            | 81-099920                 |                |                   | AR           | AR  | AR      |
| 72      |         | TUBING, INS., FIBERGLASS-SILICONE     | 88-495071                 |                |                   | AR           | AR  | AR      |
| 73      |         | INSULATOR, SILICON RUBBER             | 62-899667                 | BERQUIST       | 1009-51           | 1            | 1   | 1       |
| 74      |         | SCREW, NYLON, W/METAL CORE            | 12-980001                 | MICRO PLASTICS | 390632W037        | 1            | 1   | 1       |
| 75      |         |                                       |                           |                |                   |              |     |         |
| 76      |         |                                       |                           |                |                   |              |     |         |
| 77      |         |                                       |                           |                |                   |              |     |         |
| 78      | R37     | RESISTOR, VAR., 50K                   | 36-792210                 | BOURNS         | 3006P-1-503       | -            | 1   | 1       |
| 79      | R39     | RESISTOR, W.W., 0.25 OHM, 3W, 10%     | 31-588583                 | DALE           | CP3-PW3           | -            | 1   | 1       |
| 80      |         | POTTING PROCEDURE HUMISEAL, TYPE 1B31 | 01006545                  |                |                   | -            | -   | R       |
|         |         |                                       |                           |                |                   |              |     |         |
|         |         |                                       |                           |                |                   |              |     |         |

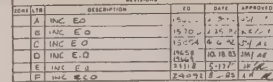












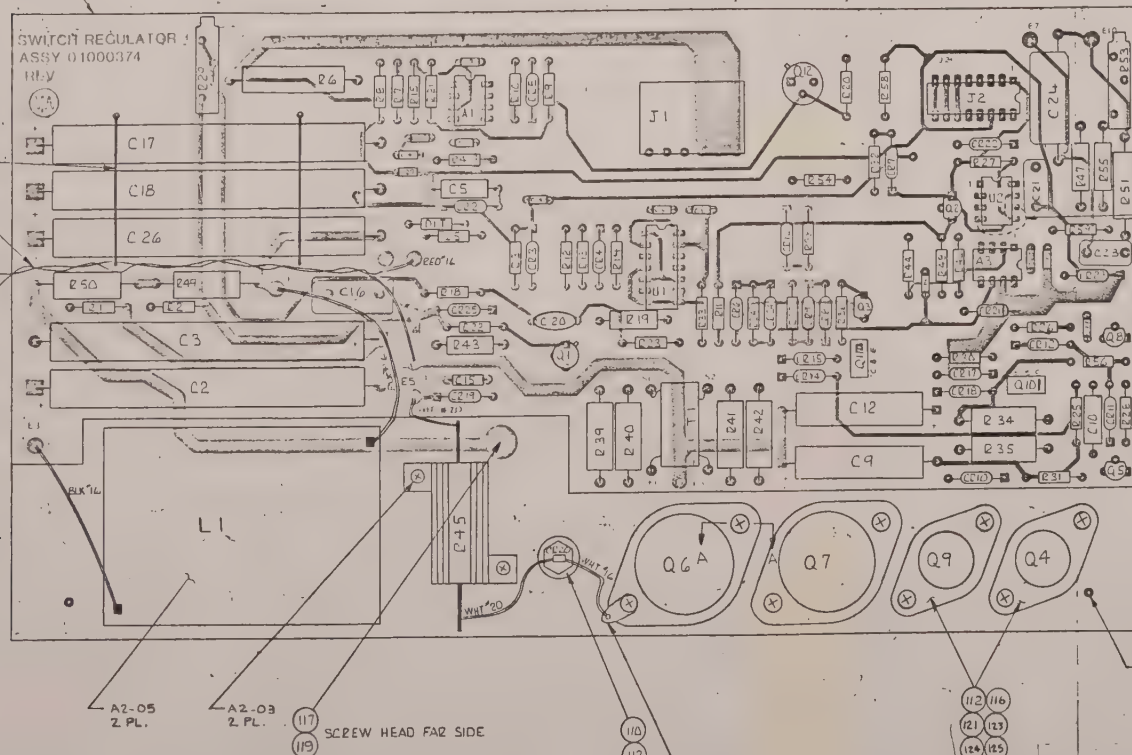
1 AL 223570-42 IN 50' 82.

NOTES: UNLESS OTHERWISE SPECIFIED:

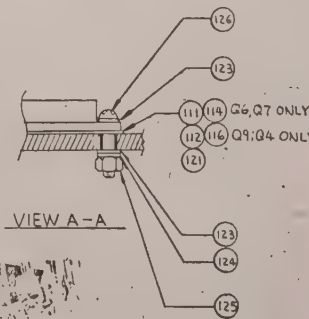
[illegible]



| REVISIONS |          |             |          |          |
|-----------|----------|-------------|----------|----------|
| REV       | NO.      | DESCRIPTION | DATE     | APPROVED |
| A         | INC E.O. | 15443       | 8-14-81  | VR       |
| B         | INC E.O. | 17427       | 10-21-81 | JS/12    |
| C         | INC E.O. | 15605       | 4/9/82   | JS/12    |
| D         | INC E.O. | 15107       | 3/31/82  | KK/KA    |
| E         | INC E.O. | 15854       | 4-6-82   | JS       |
| F         | INC E.O. | 16574       | 8-9-82   | 14/14    |
| G         | INC E.O. | 16782       | 8-11-82  | 14/14    |
| H         | INC E.O. | 15031       | 7-21-83  | 14/14    |
| J         | INC E.O. | 19258       | 10-19-83 | 14/14    |
| K         | INC E.O. | 20720       | 4-2-89   | 14/14    |
| L         | INC E.O. | 21069       | 5-15-84  | 14/14    |
| M         | INC E.O. | 22493       | 1-31-85  | 14/14    |
| N         | INC E.O. | 23318       | 8-17-86  | 14/14    |
| P         | INC E.O. | 24072       | 8-6-85   | 14/14    |
| R         | INC E.O. | 24591       | 9-25-85  | 14/14    |
| T         | INC E.O. | 26042       | 5-6-86   | 14/14    |
| U         | INC E.O. | 26504       | 7-10-86  | 14/14    |



JUMPERS SHOWN FARSIDE  
(2 PL)



- CONFORMAL COAT PER 01000374-01 ONLY
- NO INTERNAL WASHER AT SCREW HEAD END.
- ASSEMBLE PER VARIAN WORKMANSHIP STD 87-800 299.

1 MARK WITH DASH NO AND REV LETTER OF ASSY.

|                |  |              |  |                         |  |
|----------------|--|--------------|--|-------------------------|--|
| UNCLASSIFIED   |  | DATE 10/1/81 |  | MICROWAVE EQUIPMENT     |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | OPERATIONS              |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | SAINT CLARA, CALIFORNIA |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | ASSEMBLY                |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | SWITCH REGULATOR PCB    |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | DRAWING NO.             |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | D 59782 01000374-1      |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | SCALE 2/1               |  |
| CLASSIFICATION |  | DATE 10/1/81 |  | SHEET 1 OF 1            |  |

01000374









| varian  |               | MICROWAVE EQUIPMENT OPERATIONS  | SWITCH REGULATOR PCB ASSEMBLY | LM 01000374 | REV 1J            |              |    |       |
|---------|---------------|---------------------------------|-------------------------------|-------------|-------------------|--------------|----|-------|
| ITEM NO | REF DES       | DESCRIPTION                     | VARIAN PART NO                | MFG         | MFG OR MS PART NO | QTY./DASH NO |    |       |
|         |               |                                 |                               |             |                   | 00           | 01 | 02 03 |
| 1       |               | FAB, SWITCH REGULATOR           | 01000373                      |             |                   | 1            | 1  |       |
| 2       |               | SCHEMATIC                       | 01000371                      |             |                   | R            | R  |       |
| 3       |               | HEATSINK                        | 135879                        |             |                   | 1            | 1  |       |
| 4       |               |                                 |                               |             |                   |              |    |       |
| 5       | A1            | I.C. - AMPLIFIER                | 62-601232                     | NAT. SEMI   | LF356N            | 1            | 1  |       |
| 6       | A3            | I.C. - AMPLIFIER                | 62-601013                     | NAT. SEMI   | LM748CN           | 1            | 1  |       |
| 7       |               |                                 |                               |             |                   |              |    |       |
| 8       |               |                                 |                               |             |                   |              |    |       |
| 9       | C1,13         | CAPACITOR, CERAMIC, .1uf, 100V  | 41-229952                     | ANY         | CK06BX104K        | 2            | 2  |       |
| 10      | C2,3,17,18,26 | CAPACITOR, ELECT., 27uf, 250V   | 41-506106                     | SPRAGUE     | 600D276F250DX4    | 5            | 5  |       |
| 11      | C4,27         | CAPACITOR, CERAMIC, .01uf, 200V | 41-229951                     | ANY         | CK06BX103K        | 2            | 2  |       |
| 12      | C5,10         | CAPACITOR, TANT., 1uf, 50V      | 41-606802                     | SPRAGUE     | CS138G105K        | 2            | 2  |       |
| 13      | C6,7,22       | CAPACITOR, MICA, .001uf, 200V   | 41-229953                     | ANY         | CK05BX102K        | 3            | 3  |       |
| 14      | C8            | CAPACITOR, CER., .0022uf, 100V  | 41-205921                     | ERIE        | 8131-100C0G0222J  | 1            | 1  |       |
| 15      | C9,12         | CAPACITOR, ELECT., 220uf, 10V   | 41-506501                     | SPRAGUE     | 600D227G010DE4    | 2            | 2  |       |
| 16      | C11,14        | CAPACITOR, CER., .0001uf, 200V  | 41-229960                     | ANY         | CK05BX101K        | 2            | 2  |       |
| 17      | C15           | CAPACITOR, MICA, 510 pf, 500V   | 41-159952                     | ANY         | CM06FD11J03       | 1            | 1  |       |
| 18      | C16           | CAPACITOR, MICA, .01uf, 500V    | 41-159994                     | ANY         | CM07FD103J03      | 1            | 1  |       |
| 19      | C19           | CAPACITOR, CER., .022uf, 100V   | 41-229961                     | ANY         | CK06BX223K        | 1            | 1  |       |
| 20      | C20           | CAPACITOR, CER., .02uf, 400V    | 41-269515                     | ORTE        | 3410007500203M    | 1            | 1  |       |



| varian  |                                 | MICROWAVE EQUIPMENT OPERATIONS   | SWITCH REGULATOR PCB ASSEMBLY | LM 01000374 |                   | REV         |
|---------|---------------------------------|----------------------------------|-------------------------------|-------------|-------------------|-------------|
| ITEM NO | REF DES                         | DESCRIPTION                      | VARIAN PART NO                | MFG         | MFG OR MS PART NO | QTY/DASH NO |
|         |                                 |                                  |                               |             |                   | 00 01 02 03 |
| 21      | C21,23                          | CAPACITOR, MICA, .001uf, 500V    | 41-159959                     | ANY         | CM06FD102J03      | 2 2         |
| 22      | C24                             | CAPACITOR, MICA, .02uf, 500V     | 41-159995                     |             |                   | 1 1         |
| 23      | C25                             | CAPACITOR, CER., 47pf, 100V, 10% | 41-2296599                    | VARADYNE    | 2115C0G100R470K   | 1 1         |
| 24      |                                 |                                  |                               |             |                   |             |
| 25      |                                 |                                  |                               |             |                   |             |
| 26      |                                 |                                  |                               |             |                   |             |
| 27      | CR2                             | DIODE, ZENER, 12V                | 66-304960                     |             | 1N4960            | 1 1         |
| 28      | CR3-9,11,<br>12,15,17,<br>18,22 | DIODE, SIGNAL                    | 66-320914                     |             | 1N914B            | 13 13       |
| 29      | CR10                            | DIODE, RECTIFIER                 | 66-304936                     |             | 1N4936            | 1 1         |
| 30      | CR14                            | DIODE, BREAKDOWN, 130V           | 66-304985                     | UNITRODE    | 1N4985            | 1 1         |
| 31      | CR16,21                         | DIODE, ZENER                     | 66-300823                     |             | 1N823             | 2 2         |
| 32      | CR19                            | DIODE                            | 66-304937                     |             | 1N4937            | 1 1         |
| 33      | CR20                            | DIODE, RECTIFIER                 | 66-303893                     |             | 1N3893            | 1 1         |
| 34      | CR23                            | DIODE                            | 66-300758                     |             | 1N758             | 1 1         |
| 35      | CR24                            | DIODE                            | 66-304742                     |             | 1N4742            | 1 1         |
| 36      | CR25                            | DIODE                            | 66-314733                     |             | 1N4733A           | 1 1         |
| 37      |                                 |                                  |                               |             |                   |             |
| 38      |                                 |                                  |                               |             |                   |             |
| 39      |                                 |                                  |                               |             |                   |             |



| varian  |          | MICROWAVE EQUIPMENT OPERATIONS  | SWITCH REGULATOR PCB ASSEMBLY | LM 01000374 | REV U             |             |    |       |
|---------|----------|---------------------------------|-------------------------------|-------------|-------------------|-------------|----|-------|
| ITEM NO | REF DES. | DESCRIPTION                     | VARIAN PART NO                | MFG         | MFG OR MS PART NO | QTY/DASH NO |    |       |
|         |          |                                 |                               |             |                   | 00          | 01 | 02 03 |
| 40      | J1       | CONN., 6 PIN                    | 51-407151                     | MOLEX       | 09-75-1071        | 1           | 1  |       |
| 41      |          |                                 |                               |             |                   |             |    |       |
| 42      | L1       | INDUCTOR                        | 110584-00                     |             |                   | 1           | 1  |       |
| 43      |          |                                 |                               |             |                   |             |    |       |
| 44      | Q1       | TRANSISTOR, NPN                 | 62-903439                     |             | 2N3439            | 1           | 1  |       |
| 45      | Q2,3     | TRANSISTOR, PNP                 | 62-920019                     | MOTOROLA    | MPSA56            | 2           | 2  |       |
| 46      | Q4,9     | TRANSISTOR, NPN                 | 62-903878                     |             | 2N3878            | 2           | 2  |       |
| 47      | Q5,8     | TRANSISTOR, NPN                 | 62-920018                     | MOTOROLA    | MPSA06            | 2           | 2  |       |
| 48      | Q6,7     | TRANSISTOR, NPN                 | 62-906547                     | MOTOROLA    | 2N6547            | 2           | 2  |       |
| 49      | Q10      | TRANSISTOR, PNP                 | 62-920016                     | MOTOROLA    | MPSU56            | 1           | 1  |       |
| 50      | Q11      | TRANSISTOR, PNP                 | 62-920020                     | MOTOROLA    | MPSU60            | 1           | 1  |       |
| 51      | Q12      | TRANSISTOR, PNP                 | 62-902907                     | MOTOROLA    | 2N2907            | 1           | 1  |       |
| 52      |          |                                 |                               |             |                   |             |    |       |
| 53      |          |                                 |                               |             |                   |             |    |       |
| 54      |          |                                 |                               |             |                   |             |    |       |
| 55      | R1,2,12  | RESISTOR, COMP., 100K, 1/4W, 5% | 32-301610                     |             | RC07GF104J        | 3           | 3  |       |
| 56      | R3,27    | RESISTOR, COMP., 10K, 1/4W, 5%  | 32-301510                     |             | RC07GF103J        | 2           | 2  |       |
| 57      | R4       | RESISTOR, 390K, 1/4W            | 32-301639                     |             |                   | 1           | 1  |       |
| 58      | R5       | RESISTOR, 430K, 1/4W            | 32-301643                     |             |                   | 1           | 1  |       |
| 59      | R6       | RESISTOR, .01, 5W, 1%           | 35-199164                     | DALE        | LVR-5             | 1           | 1  |       |
| 60      | R7,8     | RESISTOR, M.F., 806, 1/4W, 1%   | 31-223805                     |             |                   | 2           | 2  |       |





| varian  |                          | MICROWAVE EQUIPMENT OPERATIONS     |                | SWITCH REGULATOR PCB ASSEMBLY |                   | LM 01000374  |    | REV 1 |    |
|---------|--------------------------|------------------------------------|----------------|-------------------------------|-------------------|--------------|----|-------|----|
| ITEM NO | REF DES                  | DESCRIPTION                        | VARIAN PART NO | MFG                           | MFG OR MS PART NO | QTY DASH NO. |    |       |    |
|         |                          |                                    |                |                               |                   | 00           | 01 | 02    | 03 |
| 61      | R9                       | RESISTOR, 1.8M, 1/4W, 5%           | 32-301718      |                               | RC07GF185J        | 1            | 1  |       |    |
| 62      | R10,14,15,28,30,20,21,25 | RESISTOR, COMP., 1K, 1/4W, 5%      | 32-301410      |                               | RC07GF102J        | 8            | 8  |       |    |
| 63      | R11,46                   | RESISTOR, COMP., 5.1K, 1/4W, 5%    | 32-301451      |                               | RC07GF512J        | 2            | 2  |       |    |
| 64      | R13                      | RESISTOR, M.F., 49.9K, 1/8W, 1%    | 31-610278      |                               | RN55C4992F        | 1            | 1  |       |    |
| 65      | R18                      | RESISTOR, COMP., 220K, 1/4W, 5%    | 32-301622      |                               | RC07GF224J        | 1            | 1  |       |    |
| 66      | R19                      | RESISTOR, COMP., 220K, 1/2W, 5%    | 32-201622      |                               | RC20GF224J        | 1            | 1  |       |    |
| 67      | R22                      | RESISTOR, M.F., 22.1K, 1/4W, 1%    | 31-225221      |                               | RN60              | 1            | 1  |       |    |
| 68      | R23                      | RESISTOR, COMP., 51K, 1/4W, 5%     | 32-301551      |                               | RC07GF513J        | 1            | 1  |       |    |
| 69      | R24                      | RESISTOR, COMP., 56K, 1/4W, 5%     | 32-301556      |                               | RC07GF563J        | 1            | 1  |       |    |
| 70      | R26                      | RESISTOR, COMP., 820 OHM, 1/4W, 5% | 32-301382      |                               | RC07GF821J        | 1            | 1  |       |    |
| 71      | R29                      | RESISTOR, VAR., 1 MEG              | 36-792314      | BOURNS                        | 3006P-1-105       | 1            | 1  |       |    |
| 72      | R31                      | RESISTOR, COMP., 51 OHM, 1/4W, 5%  | 32-301251      |                               | RC07GF510J        | 1            | 1  |       |    |
| 73      | R32                      | RESISTOR, COMP., 24K, 1/4W, 5%     | 32-301524      |                               | RC07GF243J        | 1            | 1  |       |    |
| 74      | R33                      | RESISTOR, COMP., 560 OHM, 1/4W, 5% | 32-301356      |                               | RC07GF561J        | 1            | 1  |       |    |
| 75      | R34,35                   | RESISTOR, W.W., .68 OHM, 2W, 5%    | 35-199120      | IRC                           | BWH TYPE          | 2            | 2  |       |    |
| 76      | R36                      | RESISTOR, COMP., 150 OHM, 1/4W, 5% | 32-301315      |                               | RC07GF151J        | 1            | 1  |       |    |
| 77      | R37                      | RESISTOR, COMP., 120 OHM, 1/4W, 5% | 32-301312      |                               | RC07GF121J        | 1            | 1  |       |    |
| 78      | R38                      | RESISTOR, COMP., 4.7K, 1/4W, 5%    | 32-301447      |                               | RC07GF472J        | 1            | 1  |       |    |
| 79      | R39-42                   | RESISTOR, W.W., 0.1 OHM, 2W, 10%   | 35-199130      | IRC                           | R4H TYPE          | 4            | 4  |       |    |



| varian  |         | MICROWAVE EQUIPMENT OPERATIONS     | SWITCH REGULATOR PCB ASSEMBLY |         | LM 01000374       | REV U       |
|---------|---------|------------------------------------|-------------------------------|---------|-------------------|-------------|
| ITEM NO | REF DES | DESCRIPTION                        | VARIAN PART NO                | MFG     | MFG OR MS PART NO | QTY/DASH NO |
|         |         |                                    |                               |         |                   | 00 01 02 03 |
| 80      | R43     | RESISTOR, COMP., 10 OHM, 1/2W, 5%  | 32-201210                     |         | RC20GF100J        | 1 1         |
| 81      | R44     | RESISTOR, COMP., 20K, 1/4W, 5%     | 32-301520                     |         | RC07GF203J        | 1 1         |
| 82      | R45     | RESISTOR, W.W., 50 OHM, 25W, 1%    | 31-588250                     | DALE    | RH25 TYPE         | 1 1         |
| 83      | R48     | RESISTOR, COMP., 3K, 1/4W, 5%      | 32-301430                     |         | RC07GF302J        | 1 1         |
| 84      | R47     | RESISTOR, M.F., 100K, 1/4W, 1%     | 31-226100                     |         | RN60              | 1 1         |
| 85      | R49,50  | RESISTOR, W.W., 7K, 3W, 5%         | 31-596003                     | DALE    | CW-2B TYPE        | 2 2         |
| 86      | R51     | RESISTOR, M.F., 200K, 1/2W, 1%     | 31-614804                     | DALE    | CMF-60-T2         | 1 1         |
| 87      | R53     | RESISTOR, VAR., 2K, 3/4W, 10%      | 36-792211                     | BOJIRNS | 3006P-1-202       | 1 1         |
| 88      | R54     | RESISTOR, COMP., 15K, 1/4W, 5%     | 32-301515                     |         | RC07GF153J        | 1 1         |
| 89      | R55     | RESISTOR, M.F., 6.19K, 1/4W, 1%    | 31-604619                     |         | RN60              | 1 1         |
| 90      | R56     | RESISTOR, COMP., 3.9K, 1/4W, 5%    | 32-301439                     |         | RC07GF392J        | 1 1         |
| 91      | R58     | RESISTOR, COMP., 100 OHM, 1/4W, 5% | 32-301310                     |         | RC07GF101J        | 1 1         |
| 92      | R59     | RESISTOR, COMP., 47K, 1/4W, 5%     | 32-301547                     |         | RC07GF473J        | 1 1         |
| 93      |         |                                    |                               |         |                   |             |
| 94      |         |                                    |                               |         |                   |             |
| 95      |         |                                    |                               |         |                   |             |
| 96      |         |                                    |                               |         |                   |             |
| 97      | T1      | INDUCTOR                           | 110447                        |         |                   | 1 1         |
| 98      |         |                                    |                               |         |                   |             |
| 99      | U1      | I.C. - TRANSISTOR ARRAY            | 62-600027                     | RCA     | CD4007AE          | 1 1         |
| 100     | U2      | I.C. - PHOTOTRANSISTOR             | 65-599720                     |         | AN25              | 1 1         |



| varian  |          | MICROWAVE EQUIPMENT OPERATIONS | SWITCH REGULATOR PCB ASSEMBLY |                 | LM 01000374       | REV U         |              |
|---------|----------|--------------------------------|-------------------------------|-----------------|-------------------|---------------|--------------|
| ITEM NO | REF DES  | DESCRIPTION                    | VARIAN PART NO                | MFG             | MFG OR MS PART NO | QTY / DASH NO |              |
|         |          |                                |                               |                 |                   | 00            | 01 - 02 - 03 |
| 101     |          |                                |                               |                 |                   |               |              |
| 102     |          |                                |                               |                 |                   |               |              |
| 103     | XA1, XA3 | SOCKET, 8 PIN                  | 54-634050                     | AUGAT           | 508-AG11D         | 2             | -            |
| 104     | XJ2      | CONN, SOCKET, 16 PIN           | 54-634023                     | CIRCUIT ASSY    | CA-16S-105SD      | 1             | 1            |
| 105     | XQ1      | MOUNTING PAD - SEMICONDUCTOR   | 62-899958                     |                 |                   | 1             | 1            |
| 106     | XU1      | SOCKET, I.C., 14 PIN           | 54-910403                     | AMP             | 640357-3          | 1             | -            |
| 107     | XU2      | SOCKET, 6 PIN                  | 54-910329                     | ROBINSON-NUGENT | ICN-063-S3-6      | 1             | -            |
| 108     |          |                                |                               |                 |                   |               |              |
| 109     |          |                                |                               |                 |                   |               |              |
| 110     |          | INSULATOR, D0-4                | 62-898000                     | UNION CARBIDE   | H-4027            | 1             | 1            |
| 111     |          | INSULATOR, T0-3                | 62-898002                     | UNION CARBIDE   | H-4001            | 2             | 2            |
| 112     |          | INSULATOR, T0-66               | 62-899381                     | INDUSTRIAL MICA | 14427             | 2             | 2            |
| 113     |          | BUSHING                        | 14-998078                     | SEASTROM        | 5610-96-62        | 1             | 1            |
| 114     |          | BUSHING                        | 22-420029                     | AMATOM          | 9223-N-140        | 4             | 4            |
| 115     |          | CABLE TIE                      | 22-119657                     | PANDUIT         | SST1, 5 I         | 2             | 2            |
| 116     |          | BUSHING                        | 22-419540                     | DELBERT BLINN   | TW-140-180-170T   | 4             | 4            |
| 117     |          | SCREW, 2-56 x 3/16             | 12-221102-03                  |                 |                   | 1             | 1            |
| 118     |          |                                |                               |                 |                   |               |              |
| 119     |          | LOCKWASHER, INTERNAL #2        | 14-307102                     |                 |                   | 1             | 1            |
| 120     |          | SOLDER LUG #4                  | 16-139902                     | SHAKEPROOF      | #2102-04-00       | 1             | 1            |
| 121     |          | THERMAL COMPOUND               | 88-298909                     | WAKETFIELD      | 120-8             | AP            | AP           |











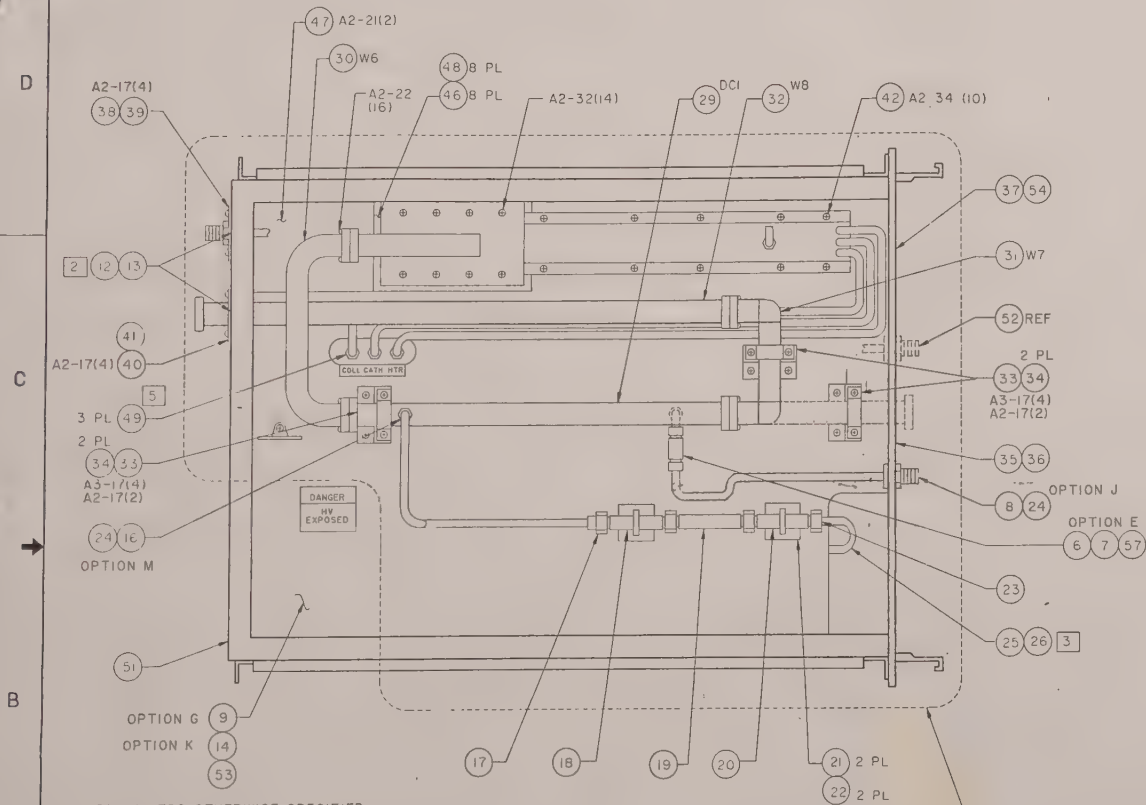








| REVISIONS |     |                     |       |         |
|-----------|-----|---------------------|-------|---------|
| ZONE      | REV | DESCRIPTION         | ECO   | DATE    |
| A         |     | MFG RELEASE/CLASS A | 27666 | 1/10/89 |



NOTES: UNLESS OTHERWISE SPECIFIED

- WORKMANSHIP PER VARIAN STD 87-800299.
- PLACE LABELS UNDER INPUT AND OUTPUT PORTS.
- SEE JUMPER TABLES H3979 SHT 3 CR2 TO AIP4-B
- THE LETTERS OR NUMBERS WHICH FOLLOW THE MODEL NUMBER DEFINE THE OPTIONS. LETTERS DEFINE THE STANDARD OPTIONS DIRECTLY. NUMBERS DEFINE THE OPTIONS THROUGH A CORRESPONDING DRAWING.

EXAMPLE:

- MODEL NUMBER VZM6993G5AEM IS A VZM6993G5 TWTA WITH AN INPUT ISOLATOR (A), OUTPUT SAMPLE PORT (E) AND VSWR PROTECTION (M).
- MODEL NUMBER VZM6993G5IXXX IS A VZM6993G5 TWTA WITH THE OPTIONS AND MODIFICATIONS SPECIFIED ON DRAWING NUMBER 01008115.
- COLLECTOR=RED, CATHODE=YELLOW, HTR=BROWN SEE H3979 SHEET 2 DETAIL A FOR ASSY INSTRUCTIONS
- TEST PER TEST SPECIFICATION 01008115.

| STANDARD OPTIONS |                                     |
|------------------|-------------------------------------|
| OPTION           | DESCRIPTION                         |
| A                | INPUT ISOLATOR                      |
| B                | INPUT ATTENUATOR                    |
| C                | OUTPUT SAMPLE PORT (FRONT "M" TYPE) |
| G                | REMOTE INTERFACE (REAR SWITCH)      |
| H                | ELAPSED TIME METER (FRONT)          |
| J                | FRONT RF CONNECTORS (INPUT/OUTPUT)  |
| K                | 230VAC PRIME POWER                  |
| L                | SOLID STATE AMPLIFIER               |
| M                | VSWR PROTECTION                     |
| N                | PIN DIODE SWITCH (REAR CONNECTOR)   |

SEE VIEW A AND B

|     |        |                          |                                 |               |    |
|-----|--------|--------------------------|---------------------------------|---------------|----|
| 2   | B      | 58-180100                | SMA CONNECTOR                   | 58            |    |
| 1   | E      | 58-180 100               | SMA CONNECTOR                   | 57            |    |
| R   |        | H3850-00                 | OUTLINE                         | 56            |    |
| R   |        | 0100917-00               | RF SCHEMATIC                    | 55            |    |
| I   |        | H2882-02                 | SPACER, FRONT PANEL             | 54            |    |
| I   |        | H3979-18                 | BASIC POWER SUPPLY              | 53            |    |
| I   |        | 58-180190                | "M" INPUT BULKHEAD              | 52            |    |
| I   | K      | H2378-40                 | LABEL, FACTORY WIRED FOR 230VAC | 51            |    |
|     |        |                          |                                 | 50            |    |
| 3   |        | 51-231851                | CONNECTOR, H.V.                 | 49            |    |
| AR  |        | 88-286900                | HEATSINK COMPOUND               | 48            |    |
| I   |        | 01005773-00              | TUBE PLATE                      | 47            |    |
| I   |        | 01005774-00              | HEATSINK                        | 46            |    |
| I   |        | 58-180100                | INPUT CONNECTOR, SMA            | 45            |    |
|     |        |                          |                                 | 44            |    |
|     |        |                          |                                 | 43            |    |
| I   |        | VTM-6294M2               | TWT                             | 42            |    |
| R   |        | SEE TABLE 3              | REAR COVER PLATE                | 41            |    |
| R   |        | SEE TABLE 3              | REAR COVER PLATE                | 40            |    |
| R   |        | SEE TABLE 3              | REAR COVER PLATE                | 39            |    |
| R   |        | SEE TABLE 3              | REAR COVER PLATE                | 38            |    |
| R   |        | SEE TABLE 2              | LOWER FRONT PANEL               | 37            |    |
| R   |        | SEE TABLE 2              | FRONT COVER PLATE               | 36            |    |
| R   |        | SEE TABLE 2              | FRONT COVER PLATE               | 35            |    |
| R   |        | SEE TABLE 1              | BRACKET                         | 34            |    |
| R   |        | SEE TABLE 1              | CLAMP, WAVEGUIDE                | 33            |    |
| R   |        | SEE TABLE 1 (W8)         | H3354-XX                        | 32            |    |
| R   |        | SEE TABLE 1 (W7)         | 01006077-XX/H3354-XX            | 31            |    |
| R   |        | SEE TABLE 1 (W6)         | 01006913-XX                     | 30            |    |
| R   | E,M    | SEE TABLE 1 (DCI)        | 01006079-XX                     | 29            |    |
| 2   | A      | 58-180100                | SMA CONNECTOR                   | 28            |    |
| I   | N      | 01008031-00              | PIN DIODE KIT                   | 27            |    |
| I   | M      | 51-407100                | CONTACT FOR AIP4-B              | 26            |    |
| AR  | M      | H2-100188                | CABLE, COAX RG188/U             | 25            |    |
| AR  | E,M    | B2-277302                | CABLE, COAX 141                 | 24            |    |
| I   | M      | 58-180107                | SMA TO RG188/U                  | 23            |    |
| 2   | M      | 22-119550                | CABLE TIE                       | 22            |    |
| 2   | M      | 22-119503                | MOUNT, CABLE TIE                | 21            |    |
| I   | M      | 83-45000                 | DETECTOR                        | 20            |    |
| I   | M      | 83-460014                | FILTER                          | 19            |    |
| I   | M      | 83-439885                | ATTENUATOR, 10 DB               | 18            |    |
| I   | M      | 58-180117                | SMA JACK                        | 17            |    |
| I   | M      | 58-180100                | SMA PLUG, 141 CABLE             | 16            |    |
| I   | L      | 01004173-07              | SSA KIT                         | 15            |    |
| I   | K      | SEE H3979 SHEET 3 NOTE 2 | H2378-40                        | 230VAC WIRING | 14 |
| I   |        | SEE NOTE 2               | H2378-01                        | LABEL, RE OUT | 13 |
| I   |        | SEE NOTE 2               | H2378-02                        | LABEL, RE IN  | 12 |
| I   | H      | 76-789815                | E.T. METER 60 HZ                | 11            |    |
| I   | H      | 76-789814                | E.T. METER 50 HZ                | 10            |    |
| I   | G      | 13586-00                 | REMOTE CONTROL OPTION KIT       | 9             |    |
| I   | E      | 58-180190                | "M" BULK HEAD                   | 8             |    |
| I   | E      | 58-180201                | ADAPTER, RT ANGLE               | 7             |    |
| I   | E      | 83-439885                | ATTENUATOR, 10 DB               | 6             |    |
| I   | B      | 83-439946                | INPUT ATTENUATOR                | 5             |    |
| I   | B      | 23-508002                | KNOB                            | 4             |    |
| 2   | A      | 12-212002-04             | SCREW, FLAT HD #2-56 X 1/4      | 3             |    |
| I   | A      | 01006661-00              | ISOLATOR SUPPORT PLATE          | 2             |    |
| I   | A      | 83-469859                | INPUT ISOLATOR                  | 1             |    |
| QTY | OPTION | MFG NOTES                | IDENTIFYING NUMBER              | DESCRIPTION   | 1  |

|                                                                |            |                     |        |                                                             |      |
|----------------------------------------------------------------|------------|---------------------|--------|-------------------------------------------------------------|------|
| UNLESS OTHERWISE SPECIFIED, CONTRACT DIMENSIONS ARE IN INCHES. |            | OR K CARTER 5/19/86 |        | VARIAN MICROWAVE EQUIPMENT DIVISION SANTA CLARA, CALIFORNIA |      |
| DECIMALS: 1 PL 1 2 PL 1 02                                     | 3 PL 1 005 | FRAC 1/16 4         | ANG 1° | CHEK                                                        | APPD |
| MATERIAL                                                       |            | VZM-6993G5          |        | DESIGN ACTIVITY APPROVAL                                    |      |
| NEXT ASSEMBLY USED ON                                          |            | SPEC NO.            |        | CUSTOMER APPROVAL                                           |      |
| APPLICATION                                                    |            | FINISH              |        | SCALE                                                       |      |
| SUPERSEDES                                                     |            | CLASS A             |        | SHEET 1 OF 2                                                |      |
| CAD: 11 01008115 A SHT                                         |            | FSCW NO. D 59782    |        | 01008115 A                                                  |      |

D 01008115



A



| ZONE REV |  | REVISIONS |  | DESCRIPTION        |  | ECD | DATE | APPROVED |
|----------|--|-----------|--|--------------------|--|-----|------|----------|
|          |  |           |  | SEE SHT 1 FOR REVS |  |     |      |          |

TABLE 1  
LOWER FRONT PANEL  
OPTIONS B.E.H.J

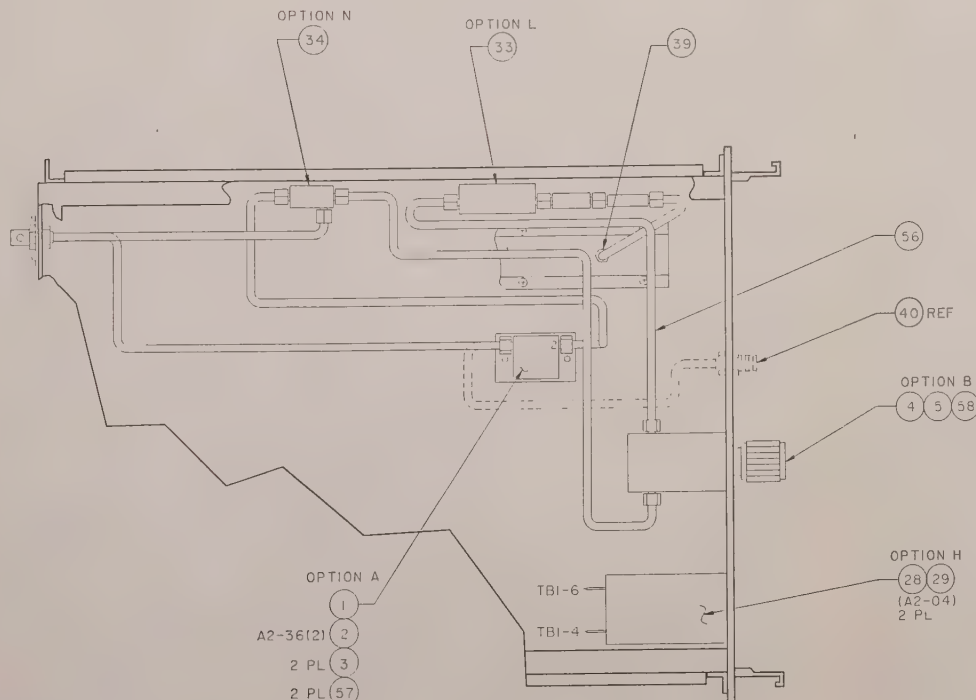
CHOOSE THE LINE WHICH  
INCLUDES THE MOST OPTIONS  
IN THE TOTAL. ALLOCATE THE  
PART FROM THAT LINE.

| OPTION          | ITEM 36<br>PART NO. | QTY |
|-----------------|---------------------|-----|
| B               | 29053-39            | 1   |
| E               | 29053-39            | 1   |
| H               | 29053-40            | 1   |
| NO 3E<br>H.C.R. | 29053-00            | 1   |
| B.E.            | 29053-01            | 1   |
| B.H.            | 29053-55            | 1   |
| B               | 29053-1             | 1   |
| E               | 29053-65            | 1   |
| E               | 29053-08            | 1   |
| H               | 29053-02            | 1   |
| B.H.            | 29053-69            | 1   |
| E.E.            | 29053-07            | 1   |
| H               | 29053-09            | 1   |
| Z.H.            | 29053-18            | 1   |
| B.H.            | 29053-21            | 1   |
|                 | 29053-17            | 1   |

TABLE 2-REAR COVER PLATES  
OPTIONS J AND N

CHOOSE THE COLUMN WHICH INCLUDES  
THE MOST OPTIONS IN THE TOTAL.  
ALLOCATE THE PART FROM THAT LINE.

| ITEM<br>NO. | PART NO. | OPTIONS & QTY'S |   |   |   |
|-------------|----------|-----------------|---|---|---|
|             |          | J               | N | J | N |
| 52          | 12980-00 | 1               | 1 | 1 | 1 |
| 52          | 12980-05 | 1               | 1 | 1 | 1 |
| 52          | 12980-04 | 1               | 1 | 2 | 1 |
| 53          | 12980-02 | 1               | 1 | 1 | 1 |
| 53          | 12980-03 | 1               | 1 | 1 | 1 |



VIEW A  
OPTIONS A,B,H,L  
AND N

|                                             |                |                              |       |            |              |
|---------------------------------------------|----------------|------------------------------|-------|------------|--------------|
| -02 -01 -00 IDENTIFYING NUMBER              |                | DESCRIPTION                  |       | CODE IDENT | ITEM         |
| QTY PER DASH NO                             |                | LIST OF MATERIALS            |       |            |              |
| UNLESS OTHERWISE SPECIFIED, CONTRACT NUMBER |                | MICROWAVE EQUIPMENT DIVISION |       |            |              |
| DECIMALS: 1 PL 1 2 PL 1                     |                | SANTA CLARA, CALIFORNIA      |       |            |              |
| 3 PL 1                                      | FRAG 1/64      | DR                           |       |            |              |
| ANG 1 *                                     | SURFACE FINISH | CHK                          |       |            |              |
| MATERIAL                                    |                | APPD                         |       |            |              |
|                                             |                | APPD                         |       |            |              |
| NEXT ASSEMBLY USED ON                       | SPEC NO.       | DESIGN ACTIVITY APPROVAL     | SIZE  | FSCM NO.   |              |
| APPLICATION                                 | FINISH         | CUSTOMER APPROVAL            | D     | 59782      |              |
|                                             |                |                              | SCALE | CLASS      | SHEET 2 OF 2 |

SUPERSEDES

CAD=11.01008116.B.SHT2

D

C

B

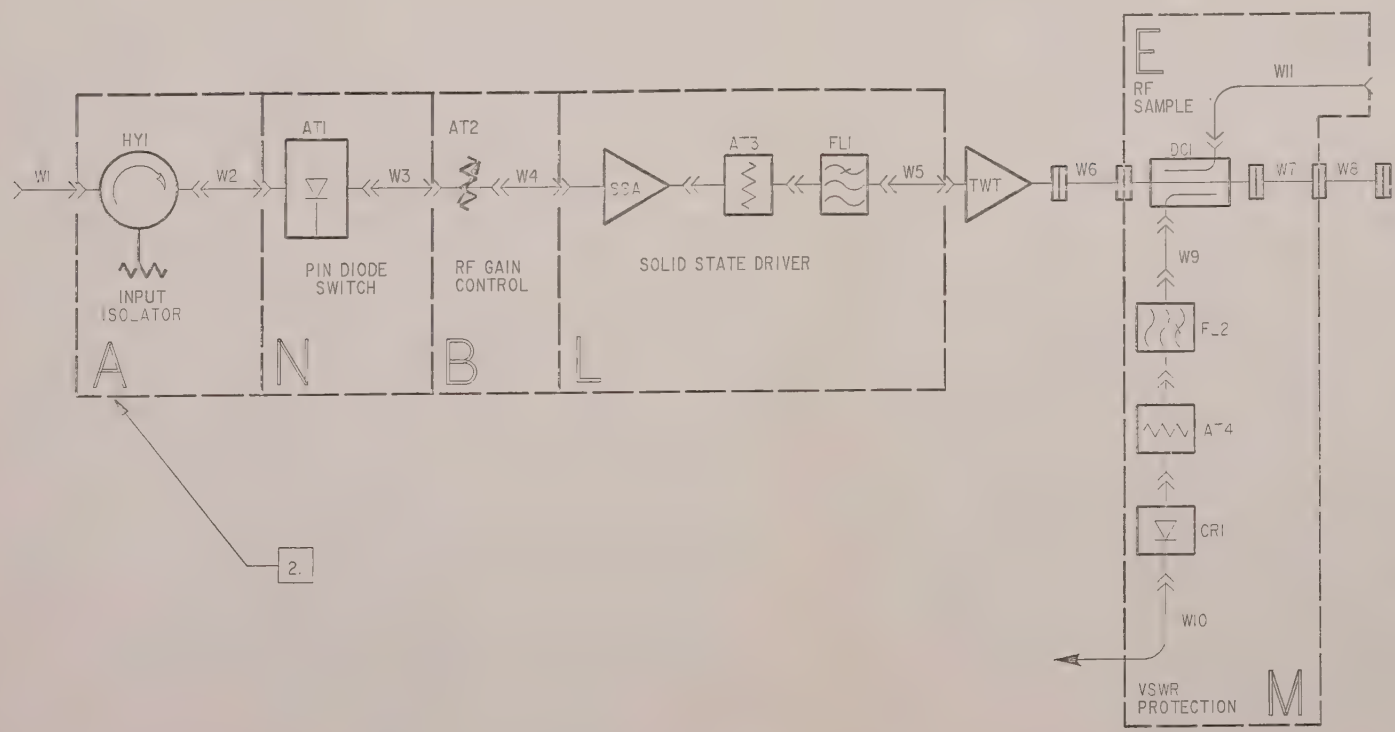
D 01008116

A





| REVISIONS |     |                     |       |         |
|-----------|-----|---------------------|-------|---------|
| ZONE      | REV | DESCRIPTION         | ECO   | DATE    |
|           | A   | MFG RELEASE/CLASS B | 27666 | 1/16/87 |



NOTES: UNLESS OTHERWISE SPECIFIED

1. AT3, AT4 VALUES ARE DETERMINED IN TEST.
2. LETTERS REFER TO OPTION DESIGNATION IN MODEL NO.

|                                                     |     |     |                          |             |                                                                |          |
|-----------------------------------------------------|-----|-----|--------------------------|-------------|----------------------------------------------------------------|----------|
| -02                                                 | -01 | -00 | IDENTIFYING NUMBER       | DESCRIPTION | CODE IDENT                                                     | ITEM     |
| QTY PER DASH NO                                     |     |     | LIST OF MATERIALS        |             |                                                                |          |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |     |     | CONTRACT NUMBER          |             | varian MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |          |
| DEC 3PL ±.1 2PL ±.02                                |     |     | DR K.CARTER 9/30/86      |             | RF SCHEMATIC 100/200W<br>TWTA WAVEGUIDE MODELS                 |          |
| 3PL ±.005 FRAC ±1/64                                |     |     | CHK                      |             |                                                                |          |
| ANG ±1°                                             |     |     | APPD J.STECK 11/20/86    |             |                                                                |          |
| MATERIAL                                            |     |     | APPD MATT TRASK 11/20/86 |             |                                                                |          |
| NEXT ASSEMBLY                                       |     |     | DESIGN ACTIVITY APPROVAL |             | SIZE                                                           | FSCM NO. |
| USED ON                                             |     |     | CUSTOMER APPROVAL        |             | B                                                              | 59782    |
| APPLICATION                                         |     |     | FINISH                   |             | 01008117                                                       |          |
|                                                     |     |     |                          |             | SCALE                                                          | CLASS B  |
|                                                     |     |     |                          |             | SHEET 1 OF 1                                                   |          |

CAD= 11.01008117.A

SUPERSEDES



| ZONE              |             | REVISIONS |      |          |  |
|-------------------|-------------|-----------|------|----------|--|
| REV               | DESCRIPTION | ECO       | DATE | APPROVED |  |
| SEE SHT 1 FOR REV |             |           |      |          |  |

TABLE 1 - OPTIONS E, J AND M  
WANTWIDE, W/O CLAMPS, BRACKETS, COUPLERS

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO | PART NO.    | OPTION COMBINATIONS & QUANTITIES | NO E, J OR M |
|---------|-------------|----------------------------------|--------------|
| 29      | 0006079-00  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 29      | 0006079-01  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 31      | 0006093-00  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 3       | 0006077-00  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 3       | 00-13354-4  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 32      | 00-13354-42 | 1 - 1 - 1 - 1 - 1 -              | -            |
| 32      | 00-13354-41 | 1 - 1 - 1 - 1 - 1 -              | -            |
| 33      | 00-13370-1  | 1 - 1 - 1 - 1 - 1 -              | -            |
| 33      | 00-13370-12 | 1 - 1 - 1 - 1 - 1 -              | -            |
| 34      | 00-13379-02 | 4 - 4 - 4 - 4 - 4 -              | -            |

\* SEE VIEW B

TABLE 2 - LOWER FRONT PANEL & FRONT PANEL COVER PLATES - OPTIONS B, E, H, J

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO. | PART NO.  | OPTION COMBINATIONS & QUANTITIES | NO B, E, H OR J |
|----------|-----------|----------------------------------|-----------------|
| 35       | 129811-08 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 36       | 129811-09 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-00 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-02 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-07 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-08 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-09 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-11 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-18 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-21 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-24 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-34 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-38 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-50 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-51 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-52 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-60 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 37       | 129053-68 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |

TABLE 3 - REAR COVER PLATES, OPTIONS E, J, M, N

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO. | PART NO.  | OPTION COMBINATIONS & QUANTITIES | NO E, J, M OR N |
|----------|-----------|----------------------------------|-----------------|
| 38       | 129811-00 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 38       | 129811-03 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 38       | 01005772  | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 39       | 129811-05 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 40       | 129811-02 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 40       | 129811-03 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 40       | 129811-05 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |
| 41       | 129811-07 | 1 - 1 - 1 - 1 - 1 - 1 - 1 -      | -               |

BEFORE INSTALLING TUBE, CUT OUT THIS AREA

VIEW C-C

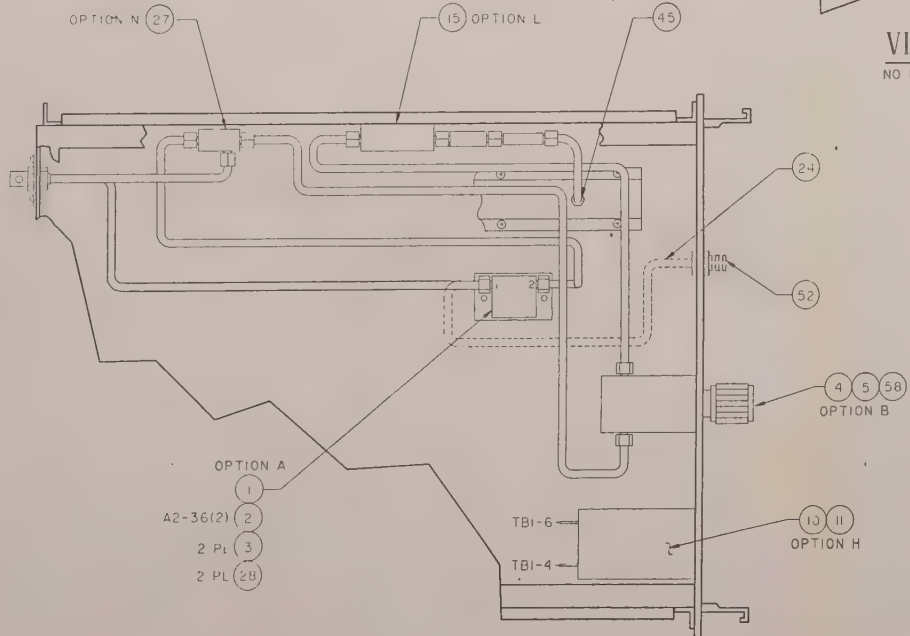
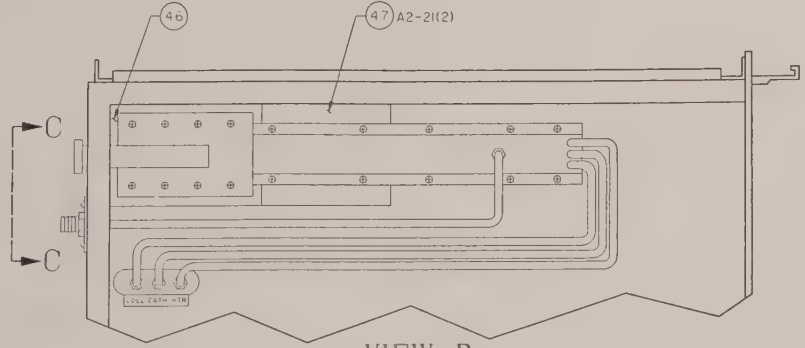
NO E, M OR J OPTION

VIEW B

SHOWS TUBE POSITION WHEN THERE IS NO OPTION E, M OR J REQUIRED.

VIEW A

INPUT OPTIONS A, B, L AND N



|                                                                  |  |                              |  |                |  |
|------------------------------------------------------------------|--|------------------------------|--|----------------|--|
| UNLESS OTHERWISE SPECIFIED, CONTRACT NUMBER IS 1005 APR 10, 1964 |  | DESCRIPTION                  |  | CDD, DCM, ITEM |  |
| DECIMALS: 1 PL 1, 2 PL 1                                         |  | LIST OF MATERIALS            |  |                |  |
| 3 PL 1                                                           |  | MICROWAVE EQUIPMENT DIVISION |  |                |  |
| ANG 1                                                            |  | SANTA CLARA, CALIFORNIA      |  |                |  |
| MATERIAL                                                         |  | FINAL ASSY.                  |  |                |  |
|                                                                  |  | VZM-6993G5                   |  |                |  |
|                                                                  |  | SERIES                       |  |                |  |
| NEXT ASSEMBLY USED ON                                            |  | SIZE                         |  | FSCM NO.       |  |
| APPLICATION                                                      |  | D                            |  | 59782          |  |
| FINISH                                                           |  | CLASS                        |  | A              |  |
|                                                                  |  | SHEET                        |  | 2 OF 2         |  |

D 01008115

A



4

3

2

1

| REVISIONS |     |                     |       |         |
|-----------|-----|---------------------|-------|---------|
| ZONE      | REV | DESCRIPTION         | ECO   | DATE    |
|           | A   | MFG RELEASE/CLASS A | 27666 | 1/16/87 |

# G-SERIES PERFORMANCE TABLE

| TWTA       | TWT        | FREQ RANGE (GHz)               | NO OPTIONS           |                                 | ADDITIVE OPTIONS [5] |     |       |     | INTERACTIVE OPTIONS [3]  |                       |                               |                             |                    |           |                 |           |              |           |                                     |           |                               |           |                            |           |              |           |
|------------|------------|--------------------------------|----------------------|---------------------------------|----------------------|-----|-------|-----|--------------------------|-----------------------|-------------------------------|-----------------------------|--------------------|-----------|-----------------|-----------|--------------|-----------|-------------------------------------|-----------|-------------------------------|-----------|----------------------------|-----------|--------------|-----------|
|            |            |                                | STD PWR SPEC (dBm)   | STD GAIN AT RATED PWR SPEC (dB) | A                    | B   | L [4] | N   | E                        |                       | J                             |                             | M                  |           | E,M             |           | E,J          |           | M,J                                 |           | E,J,M                         |           |                            |           |              |           |
|            |            |                                |                      |                                 |                      |     |       |     | INPUT ISOLATOR GAIN LOSS | INPUT ATTEN GAIN LOSS | SOLID STATE AMP GAIN INCREASE | .PIN DIODE SWITCH GAIN LOSS | OUTPUT SAMPLE PORT |           | FRONT RF IN/OUT |           | VSWR PROTECT |           | OUTPUT SAMPLE PORT AND FRONT IN/OUT |           | VSWR PROTECT AND FRONT IN/OUT |           | OUTPUT SAMPLE FRONT IN/OUT |           | VSWR PROTECT |           |
|            |            |                                |                      |                                 |                      |     |       |     |                          |                       |                               |                             | PWR LOSS           | GAIN LOSS | PWR LOSS        | GAIN LOSS | PWR LOSS     | GAIN LOSS | PWR LOSS                            | GAIN LOSS | PWR LOSS                      | GAIN LOSS | PWR LOSS                   | GAIN LOSS | PWR LOSS     | GAIN LOSS |
| VZL-6943G5 | VTL-6242FI | 1 - 2                          | 53.0                 | 30.0                            | 6                    | 5   | 23    | 1.0 | .70                      | .70                   | .15                           | 0                           | .45                | .45       | .60             | .60       | .30          | .30       | .30                                 | .30       | .45                           | .45       |                            |           |              |           |
| VZS-6953G5 | VTS-6252FI | 2 - 4                          | 53.0                 | 37.0                            | .6                   | .5  | .6    | 1.0 | .70                      | .70                   | .25                           | 0                           | .55                | .55       | .75             | .75       | .40          | .40       | .40                                 | .40       | .55                           | .55       |                            |           |              |           |
| VZC-6962G5 | VTC-6260FI | 4 - 8                          | 50.0                 | 35.0                            | .6                   | .5  | .15   | 1.2 | .70                      | .70                   | .35                           | 0                           | .70                | .70       | .90             | .90       | .50          | .50       | .50                                 | .50       | .65                           | .65       |                            |           |              |           |
| VZC-6963G5 | VTC-6262FI | 4 - 8                          | 53.0                 | 37.0                            | .6                   | .5  | .13   | 1.2 | .70                      | .70                   | .35                           | 0                           | .70                | .70       | .90             | .90       | .50          | .50       | .50                                 | .50       | .65                           | .65       |                            |           |              |           |
| VZX-6983G5 | VTX-6282FI | 8 - 12.4                       | 53.0                 | 35.0                            | 6                    | .5  | .18   | 1.5 | .30                      | .30                   | .20                           | 0                           | .30                | .30       | .30             | .30       | .20          | .20       | .20                                 | .20       | .20                           | .20       |                            |           |              |           |
| VZU-6992G5 | VTU-6290FI | 12.4 - 18                      | 50.0                 | 37.0                            | 8                    | 1.0 | .23   | 2.0 | .55                      | .55                   | .35                           | 0                           | .55                | .55       | .55             | .55       | .35          | .35       | .35                                 | .35       | .35                           | .35       |                            |           |              |           |
| VZM-6993G5 | VTM-6294M2 | 8 - 8.5<br>8.5 - 16<br>16 - 18 | 51.8<br>53.0<br>51.8 | 30.0<br>25.0<br>30.0            | .8                   | 1.0 | .13   | 2.0 | .55                      | .55                   | .35                           | 0                           | .55                | .55       | .55             | .55       | .35          | .35       | .35                                 | .35       | .35                           | .35       |                            |           |              |           |
| VZM-699236 | VTU-6295FI | 9 - 17                         | 50.0                 | 37.0                            | .8                   | 1.0 | .13   | 2.0 | .55                      | .55                   | .35                           | 0                           | .55                | .55       | .55             | .55       | .35          | .35       | .35                                 | .35       | .35                           | .35       |                            |           |              |           |

NOTE: UNLESS OTHERWISE SPECIFIED

1. USE THE PERFORMANCE TABLE TO CALCULATE MINIMUM RF OUTPUT. SEE EXAMPLE:

| VZX-6983G5AJLM                  | POWER dBm | GAIN dB |
|---------------------------------|-----------|---------|
| STANDARD SPEC (WITHOUT OPTIONS) | 53.0      | 35.0    |
| OPTION A                        | -         | -0.6    |
| OPTION L                        | -         | +18.0   |
| OPTION M.J                      | -0.2      | -0.2    |
| SPEC. WITH OPTIONS              | 52.8 dBm  | 52.2 dB |

2. IF THE LAST FOUR DIGITS OF THE MODEL NO. ARE NUMERICALLY CODED, REFER TO THE DRAWING 0100XXXX FOR RF PERFORMANCE SPECIFICATIONS.

3. CHOOSE ONE COLUMN FROM THIS GROUP DESCRIBING THE CORRECT COMBINATION OF OPTIONS E, J OR M.

4. GAIN IS SMALL SIGNAL.

5. CHOOSE FROM AS MANY COLUMNS AS APPLY.

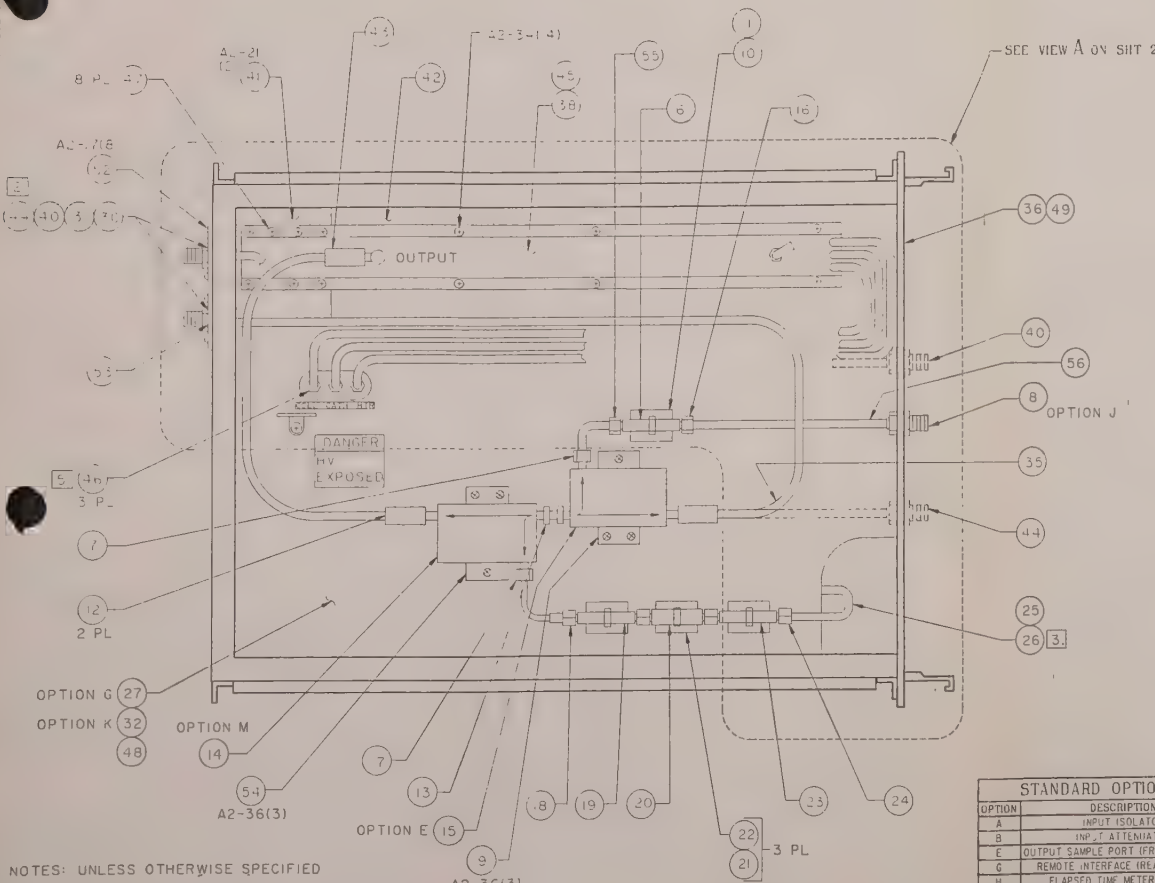
|                 |     |     |                    |             |            |      |
|-----------------|-----|-----|--------------------|-------------|------------|------|
| -02             | -01 | -00 | IDENTIFYING NUMBER | DESCRIPTION | CODE IDENT | ITEM |
| QTY PER DASH NO |     |     | LIST OF MATERIALS  |             |            |      |

|                                                                                         |  |                                                         |  |                                |  |                                                                          |  |                                                |  |                          |  |              |  |            |  |
|-----------------------------------------------------------------------------------------|--|---------------------------------------------------------|--|--------------------------------|--|--------------------------------------------------------------------------|--|------------------------------------------------|--|--------------------------|--|--------------|--|------------|--|
| CONTRACT NUMBER<br>DEC 11/PL 1.1 ZPL 1.02<br>3PL 1.005 FRAC 1/4<br>ANGLE 1°<br>MATERIAL |  | DR K. CARTER<br>CHK<br>APPD<br>DESIGN ACTIVITY APPROVAL |  | DATE 11/24/86<br>12/9<br>12/11 |  | <b>varian</b><br>MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |  | 100/200W TWTA OPTIONS<br>RF TEST SPECIFICATION |  | SIZE FSCM NO.<br>C 59782 |  | 01008118     |  | REV. A     |  |
| NEXT ASSEMBLY                                                                           |  | USED ON                                                 |  | SPEC NO.                       |  | CUSTOMER APPROVAL                                                        |  | SCALE                                          |  | CLASS A                  |  | SHEET 1 OF 1 |  | SUPERSEDES |  |





|      |     | REVISIONS           |       |         |          |
|------|-----|---------------------|-------|---------|----------|
| ZONE | REV | DESCRIPTION         | ECO   | DATE    | APPROVED |
| A    |     | MFG RELEASE/CLASS A | 27666 | 1-16-87 | KC/MT/JS |
| B    |     | INC ECO             | 27802 | 2-19-87 | STN/MT   |



NOTES: UNLESS OTHERWISE SPECIFIED

- WORKMANSHIP PER VARIAN STD 87-800299.
  - PLACE LABELS UNDER INPUT AND OUTPUT PORTS.
  - SEE JUMPER TABLES ON DWG 113979 SHT 3 CR2 TO AIP4-B
  - THE LETTERS OR NUMBERS WHICH FOLLOW THE MODEL NUMBER DEFINE THE OPTIONS. LETTERS DEFINE THE STANDARD OPTIONS DIRECTLY. NUMBERS DEFINE THE OPTIONS THROUGH A CORRESPONDING DRAWING.
- EXAMPLES:
- MODEL NUMBER VZM6953G5AEM IS A VZM6953G5 TWTA WITH AN INPUT ISOLATOR (A), OUTPUT SAMPLE PORT (E) AND VSWR PROTECTION (M).
  - MODEL NUMBER VZM6953G5XXXX IS A VZM6953G5 TWTA WITH THE OPTIONS AND MODIFICATIONS SPECIFIED ON DRAWING NUMBER 0100XXXX.

- COLLECTOR=RED, CATHODE=YELLOW, HTR=BROWN SEE 113979 SHEET 2 DETAIL A FOR IN ASSY INSTRUCTIONS
- TEST PER TEST SPECIFICATION 01008119.
- REWIRE H.V. MODULE 113919-00 IN BASIC POWER SUPPLY AS SHOWN IN VIEW B.

| STANDARD OPTIONS |                                     |
|------------------|-------------------------------------|
| OPTION           | DESCRIPTION                         |
| A                | INPUT ISOLATOR                      |
| B                | IMP. ATTENUATOR                     |
| E                | OUTPUT SAMPLE PORT (FRONT "N" TYPE) |
| G                | REMOTE INTERFACE (REAR SWITCH)      |
| H                | ELAPSED TIME METER (FRONT)          |
| J                | FRONT RF CONNECTORS (INPUT/OUTPUT)  |
| K                | 230VAC PR. VE. POWER                |
| L                | SOL. D STATE AMPLIFIER              |
| M                | VSWR PROTECTION                     |
| N                | PIN DIODE SWITCH (REAR CONNECTOR)   |

|     |                            |              |                                    |      |
|-----|----------------------------|--------------|------------------------------------|------|
| 2   | B                          | 58-180100    | SMA CONNECTOR, MALE                | 58   |
| 2   | A                          | 58-180100    | SMA CONNECTOR, MALE                | 57   |
| AR  |                            | 82-299902    | CABLE, COAX SEMI RIGID 141         | 56   |
| 1   | E                          | 58-180107    | SMA CONNECTOR, FEMALE              | 55   |
| 1   | M                          | 133034-00    | COUPLER SUPPORT PLATE              | 54   |
| R   |                            | 129810-XX    | REAR COVER PLATE                   | 53   |
| R   | SEE TABLE 2                | 129811-XX    | REAR COVER PLATE                   | 52   |
| R   |                            | 113850-00    | OUTLINE                            | 51   |
| R   | FOR OPTION INSTALLATION    | 01008139-00  | RF SCHEMATIC                       | 50   |
| 1   |                            | 112882-02    | SPACER, FRONT PANEL                | 49   |
| 1   | SEE VIEW B                 | 113979-18    | BASIC POWER SUPPLY                 | 48   |
| B   |                            | 12-222008-24 | SCREW, PHIL. #8-32 X 1 1/2 LG, SST | 47   |
| 3   |                            | 51-211851    | CONNECTOR, H.V.                    | 46   |
| AR  | APPLY UNIFORM THIN COATING | 88-258903    | HEATSINK COMPOUND                  | 45   |
| 1   |                            | 58-180153    | OUTPUT BULKHEAD, "N" TYPE          | 44   |
| 1   |                            | 58-180152    | OUTPUT CONNECTOR, "N" TYPE         | 43   |
| 1   |                            | 129709-04    | TUBE PLATE                         | 42   |
| 1   |                            | 14999-01     | HEATSINK                           | 41   |
| 1   |                            | 58-180179    | INPUT BULKHEAD, "N" TYPE           | 40   |
| 1   |                            | 58-180100    | INPUT CONNECTOR, SMA               | 39   |
| 1   |                            | 115-6252H    | TWT                                | 38   |
|     |                            |              |                                    | 37   |
| R   | SEE TABLE 1                | 129053-X1    | LOWER FRONT PANEL                  | 36   |
| AR  |                            | 82-999903    | CABLE, COAX HIGH POWER 375         | 35   |
| 1   | N                          | 01008031-00  | PIN DIODE KIT                      | 34   |
| 1   | L                          | 01004173-01  | S.S.A. KIT                         | 33   |
| 1   | K                          | 112378-40    | 230VAC WIRING                      | 32   |
| 1   | SEE NOTE 2                 | 112378-01    | LABEL RF OUT                       | 31   |
| 1   | SEE NOTE 2                 | 112378-00    | LABEL RF IN                        | 30   |
| 1   | H                          | 76-789815    | E.T. METER 60 HZ                   | 29   |
| 1   | H                          | 76-789814    | E.T. METER 50 HZ                   | 28   |
| 1   | G                          | 13505-00     | REMOTE CONTROL OPTION KIT          | 27   |
| 1   | M                          | 51-407110    | CONTACT FOR AIP4-B                 | 26   |
| AR  | M                          | 82-100186    | CABLE, COAX, RG-188/U              | 25   |
| 1   | M                          | 58-180107    | SMA PLUG, RG-188/U                 | 24   |
| 1   | M                          | 83-450500    | DETECTOR                           | 23   |
| 3   | M                          | 22-19950     | CABLE TIE                          | 22   |
| 3   | M                          | 22-19950     | MOUNT, CABLE TIE                   | 21   |
| 1   | M                          | 83-450501    | LP FILTER                          | 20   |
| 1   | M                          | 83-439885    | ATTENUATOR, 10 DB                  | 19   |
| 1   | M                          | 58-180117    | SMA JACK                           | 18   |
| 1   | M                          | 58-180183    | TYPE "N" PLUG, 141 CABLE           | 17   |
| 1   | E                          | 58-180100    | SMA CONNECTOR, MALE                | 16   |
| 1   | E                          | 83-330004    | COUPLER, DIRECTIONAL               | 15   |
| 1   | M                          | 83-330004    | COUPLER, DIRECTIONAL               | 14   |
| 1   | EBM                        | 58-099899    | ADAPTER, "N" TO "N"                | 13   |
| 2   | E.M                        | 58-180182    | TYPE "N" PLUG, 375 CABLE           | 12   |
| 1   | E                          | 22-19950     | CABLE TIE                          | 11   |
| 1   | E                          | 22-19950     | MOUNT, CABLE TIE                   | 10   |
| 1   | E                          | 131034-00    | COUPLER SUPPORT PLATE              | 9    |
| 1   | E                          | 58-180179    | TYPE "N" BULK HEAD                 | 8    |
| 1   | E                          | 58-180182    | TYPE "N" PLUG, 141 CABLE           | 7    |
| 1   | E                          | 83-439877    | ATTENUATOR, 10 DB                  | 6    |
| 1   | B                          | 83-439842    | INPUT ATTENUATOR                   | 5    |
| 1   | B                          | 23-508002    | KNOB                               | 4    |
| 2   | A                          | 12-21002-04  | SCREW, FLAT HD #2-56 X 1/4         | 3    |
| 1   | A                          | 01006667-00  | ISOLATOR SUPPORT PLATE             | 2    |
| 1   | A                          | 83-469 845   | INPUT ISOLATOR                     | 1    |
| QTY | OPTION                     | ITEM         | DESCRIPTION                        | ITEM |

|                                                     |                |                          |         |         |  |                                                         |  |
|-----------------------------------------------------|----------------|--------------------------|---------|---------|--|---------------------------------------------------------|--|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES |                | CONTRACT NUMBER          |         | VARIAN  |  | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |  |
| DECIMALS: 1 PL 1 2 PL 1 02                          | DR             | K CARTER                 | 8/9/86  |         |  |                                                         |  |
| 3 PL 1 005                                          | FRACTION: 1/64 | CHK                      |         |         |  |                                                         |  |
| ANGLES                                              | SWAGE          | APPRO                    | J STECK | 8/9/86  |  |                                                         |  |
| MATERIAL                                            |                | APPRO                    | M TRASK | 2/10/86 |  |                                                         |  |
| NEXT ASSEMBLY                                       |                | DESIGN ACTIVITY APPROVAL |         |         |  |                                                         |  |
| USED ON                                             |                | CUSTOMER APPROVAL        |         |         |  |                                                         |  |
| APPLICATION                                         |                | FINISH                   |         |         |  |                                                         |  |
| SPEC. NO.                                           |                | SCALE                    |         |         |  |                                                         |  |
| VZS-6953G5                                          |                | CLASS A                  |         |         |  |                                                         |  |
| SHEET 1 OF 2                                        |                | CLASS A                  |         |         |  |                                                         |  |
| SUPERSEDES                                          |                | SCALE                    |         |         |  |                                                         |  |
| CAD: 11 01008119 B SHT                              |                | SCALE                    |         |         |  |                                                         |  |

D

C

B

D 01008119

A



| ZONE REV |  | REVISIONS          |     |      |          |
|----------|--|--------------------|-----|------|----------|
|          |  | DESCRIPTION        | ECO | DATE | APPROVED |
|          |  | SEE SHT 1 FOR REVS |     |      |          |

TABLE 1  
LOWER FRONT PANEL  
OPTIONS B,E,H,I

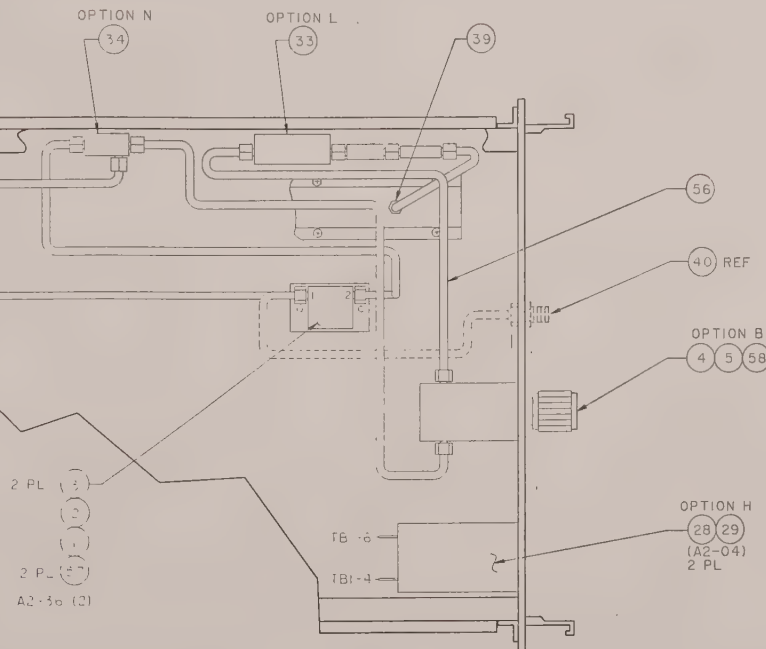
CHOOSE THE LINE WHICH INCLUDES THE MOST OPTIONS IN THE TOTAL. ALLOCATE THE PANEL FROM THAT LINE.

| OPTION        | ITEM 36 PART NO. | QTY |
|---------------|------------------|-----|
| B.J           | 29053-39         | 1   |
| E.J           | 29053-9          | 1   |
| H.J           | 29053-40         | 1   |
| NO B,E H OR J | 29053-00         | 1   |
| C             | 29053-1          | 1   |
| B.H           | 29053-55         | 1   |
| S             | 29053-1          | 1   |
| I.H           | 29053-65         | 1   |
| E             | 29053-13         | 1   |
| M             | 29053-2          | 1   |
| B.E.H         | 29053-99         | 1   |
| B.E           | 29053-2          | 1   |
| G.M           | 29053-19         | 1   |
| F.H           | 29053-9          | 1   |
| E.H           | 29053-1          | 1   |
| J             | 29053-1          | 1   |

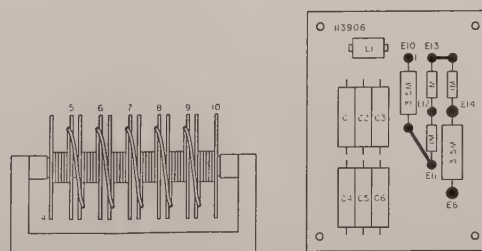
TABLE 2-REAR COVER PLATES  
OPTIONS J AND N

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TOTAL. ALLOCATE THE PANEL FROM THAT LINE.

| ITEM NO. | PART NO. | OPTIONS & QTY |   |   |   |
|----------|----------|---------------|---|---|---|
|          |          | J             | N | J | J |
| 52       | 29811-00 | -             | 1 | - | 1 |
| 52       | 29811-05 | 1             | - | - | - |
| 52       | 29811-04 | 1             | - | 2 | - |
| 53       | 29810-02 | 1             | 1 | 1 | - |
| 53       | 29810-03 | -             | - | - | 1 |



VIEW A  
OPTIONS A,B,H,L  
AND N



H.V. TRANSFORMER H3994

H.V. P.C.B. H3906

VIEW B

ON H.V. TRANSFORMER:

DESOLDER GRAY WIRE FROM IO, AND BLUE WIRE FROM 9.  
SOLDER GRAY TO 8, AND BLUE TO 5.

ON TOP PCB ASSY:

SOLDER H.V. WIRE JUMPER P/N 81-259754 OR EQUIVALENT FROM E10 TO E13.

|                                                                               |  |                                                         |  |                 |
|-------------------------------------------------------------------------------|--|---------------------------------------------------------|--|-----------------|
| -02 -01 -00 IDENTIFYING NUMBER                                                |  | DESCRIPTION                                             |  | CODE IDENT ITEM |
| QTY PER DASH NO                                                               |  | LIST OF MATERIALS                                       |  |                 |
| CONTRACT NUMBER                                                               |  | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |  |                 |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES<br>DECIMALS (PLT) 1/20 |  | FINAL ASSY.<br>VZS-695365<br>SERIES                     |  |                 |
| 3PL Y FRAZ 11/84                                                              |  | SIZE FSCM NO.<br>D 59782 01008119                       |  | B               |
| ANG X * SUPPL PAGE Y                                                          |  | SCALE - CLASS A SHEET 2 OF 2                            |  |                 |
| MATERIAL                                                                      |  | CUSTOMER APPROVAL                                       |  |                 |
| NEXT ASSEMBLY USED ON                                                         |  | DESIGN ACTIVITY APPROVAL                                |  |                 |
| SPEC NO.                                                                      |  | SUPERSEDES                                              |  |                 |
| APPLICATION                                                                   |  | FINISH                                                  |  |                 |

D

C

B

D 01008119

A

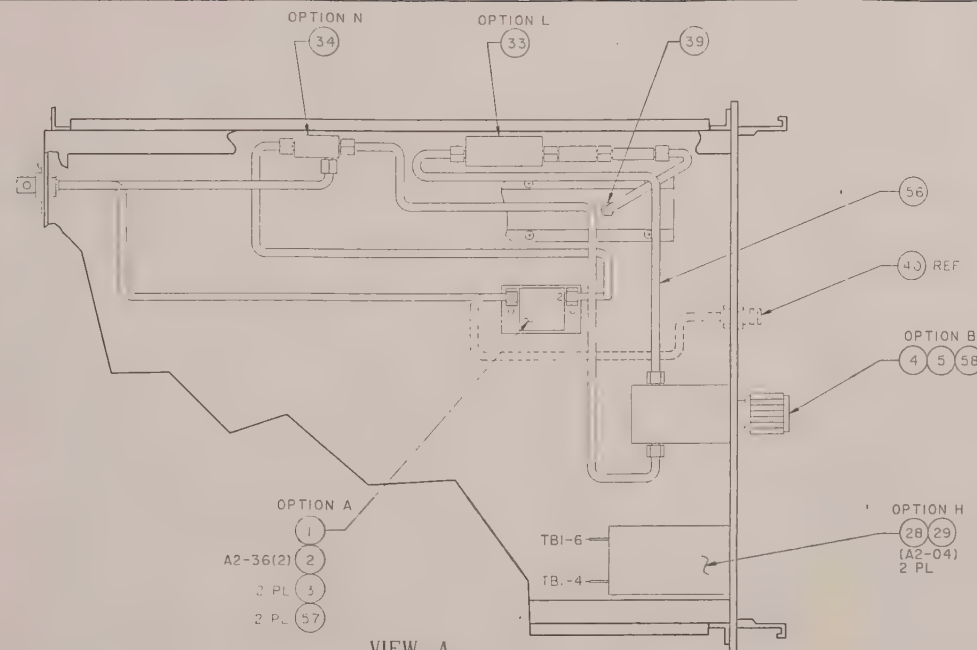


7 REWIRE H.V. MODULE 113919-00 IN BASIC POWER SUPPLY  
AS SHOWN IN VIEW B





| REVISIONS |     |                   |     |      |
|-----------|-----|-------------------|-----|------|
| ZONE      | REV | DESCRIPTION       | ECO | DATE |
|           |     | SEE SHT 1 FOR REV |     |      |



VIEW A  
OPTIONS A,B,H,L  
AND N

TABLE 1  
LOWER FRONT PANEL  
OPTIONS B,E,H,J

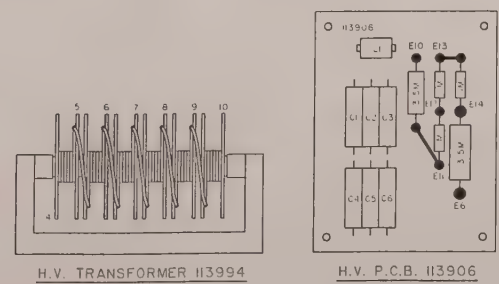
CHOOSE THE LINE WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE THE PANEL FROM THAT LINE.

| OPTION         | ITEM 36 PART NO. | QTY |
|----------------|------------------|-----|
| B,J            | 129053-39        | 1   |
| E,J            | 129053-19        | 1   |
| H,J            | 129053-40        | 1   |
| NO S.L. n.u.R. | 129053-00        | 1   |
| H,J            | 129053-61        | 1   |
| H,H            | 129053-55        | 1   |
| B              | 129053-11        | 1   |
| H,H,J          | 129053-65        | 1   |
| E              | 129053-08        | 1   |
| H              | 129053-02        | 1   |
| B,E,H,J        | 129053-69        | 1   |
| B,E            | 129053-07        | 1   |
| B,H            | 129053-09        | 1   |
| E,H            | 129053-8         | 1   |
| B,E,H          | 129053-21        | 1   |
| H              | 129053-1         | 1   |

TABLE 2-REAR COVER PLATES  
OPTIONS J AND N

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE THE PANEL FROM THAT LINE.

| ITEM NO. | PART NO.  | OPTIONS & QTY |   |     |   |
|----------|-----------|---------------|---|-----|---|
|          |           | J             | N | J,N | J |
| 52       | 129810-00 | -             | 1 | -   | 1 |
| 52       | 129810-05 | 1             | - | -   | - |
| 52       | 129810-04 | 1             | - | 2   | - |
| 53       | 129810-02 | 1             | 1 | 1   | - |
| 53       | 129810-03 | -             | - | -   | 1 |



H.V. TRANSFORMER 113994

H.V. P.C.B. 113906

VIEW B

ON H.V. TRANSFORMER:

DESOLDER H.V. WIRE FROM 9 (BLUE), AND 10 (GRAY).  
SOLDER GRAY TO 9, AND BLUE TO 4.

H.V. PCB:

JUMPER E10 TO E13 USING 4" H.V. WIRE (P/N 81-259754 OR EQUIVLENT).

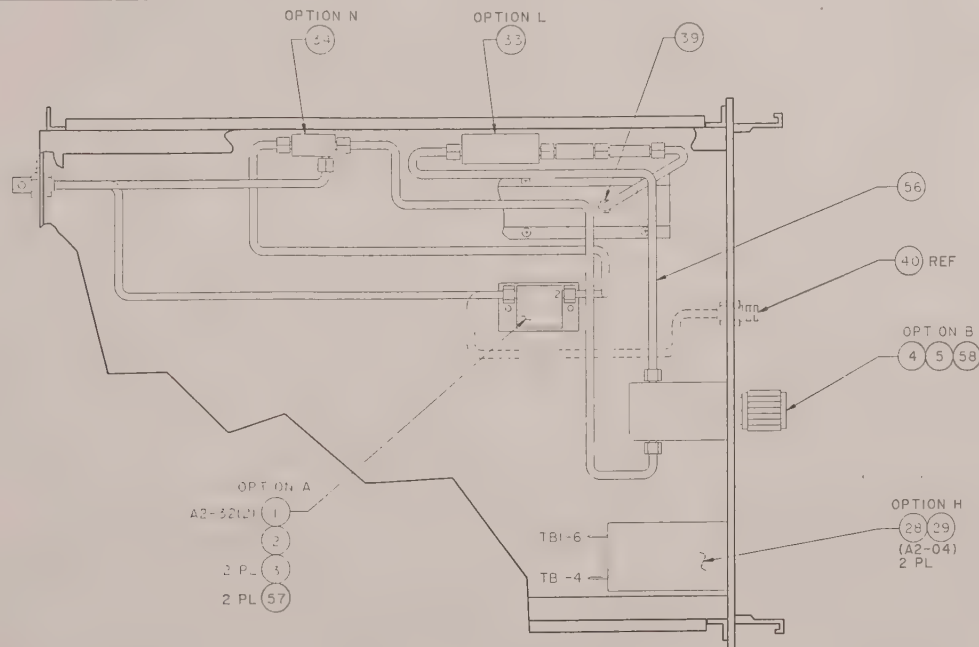
|                                |  |                          |  |                                                         |      |
|--------------------------------|--|--------------------------|--|---------------------------------------------------------|------|
| -02 -01 -00 IDENTIFYING NUMBER |  | DESCRIPTION              |  | CODE IDENT                                              | ITEM |
| QTY PER DASH NO                |  | LIST OF MATERIALS        |  |                                                         |      |
| CONTRACT NUMBER                |  | varian                   |  | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |      |
| DR                             |  | CHK                      |  | FINAL ASSY.<br>VZL-6943G5<br>SERIES                     |      |
| APPRO                          |  | DESIGN ACTIVITY APPROVAL |  | SIZE FSCW NO.<br>D 59782 01008120                       |      |
| NEXT ASSEMBLY USED ON          |  | CUSTOMER APPROVAL        |  | SCALE - CLASS A SHEET 2 OF 2                            |      |
| APPLICATON                     |  | FINISH                   |  | SUPERSEDES                                              |      |



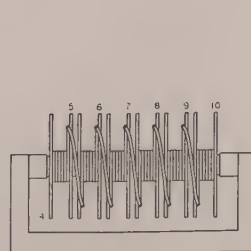
A



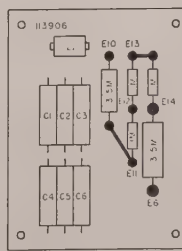
| ZONE REV |  | REVISIONS           |     |      |          |
|----------|--|---------------------|-----|------|----------|
|          |  | DESCRIPTION         | ECO | DATE | APPROVED |
|          |  | SEE SHT 1 FOR REV'S |     |      |          |



VIEW A  
OPTIONS A,B,H,L  
AND N



H.V. TRANSFORMER 113994



H.V. P.C.B. 113906

VIEW B

H.V. TRANSFORMER:  
DESOLDER GRAY AND BLUE. SOLDER GRAY TO 9, AND BLUE TO 7.  
H.V. PCB:  
JUMPER E10 TO E12

TABLE 1  
LOWER FRONT PANEL  
OPTIONS B,E,H,J

CHOOSE THE LINE WHICH  
INCLUDES THE MOST OPTIONS  
IN THE TWTA. ALLOCATE THE  
PANEL FROM THAT LINE.

| OPTION      | ITEM 36<br>PART NO. | QTY |
|-------------|---------------------|-----|
| B,J         | 29053-39            | 1   |
| E           | 29053-39            | 1   |
| H           | 29053-40            | 1   |
| J           | 29053-41            | 1   |
| B,E         | 29053-61            | 1   |
| B,H         | 29053-55            | 1   |
| H           | 29053-4             | 1   |
| E,H         | 29053-65            | 1   |
| E           | 29053-08            | 1   |
| H           | 29053-02            | 1   |
| B,E,H       | 29053-69            | 1   |
| B,L         | 29053-07            | 1   |
| B,H         | 29053-09            | 1   |
| E,H         | 29053-18            | 1   |
| B,H         | 29053-21            | 1   |
| H,B,E<br>OR | 29053-00            | 1   |

TABLE 2-REAR COVER PLATES  
OPTIONS J AND N

CHOOSE THE COLUMN WHICH INCLUDES  
THE MOST OPTIONS IN THE TWTA.  
ALLOCATE THE PANEL FROM THAT LINE.

| ITEM<br>NO. | PART NO.  | OPTIONS-QUANTITY |   |   |     |
|-------------|-----------|------------------|---|---|-----|
|             |           | J                | N | L | SEL |
| 52          | 12981-00  | 1                | 1 | - | -   |
| 52          | 12988-05  | -                | - | 1 | -   |
| 52          | 12988-04  | -                | 2 | - | 1   |
| 53          | 129810-02 | -                | 1 | 1 | 1   |
| 53          | 129810-03 | 1                | - | - | -   |

|                                |  |                                                         |  |                 |
|--------------------------------|--|---------------------------------------------------------|--|-----------------|
| -02 -01 -00 IDENTIFYING NUMBER |  | DESCRIPTION                                             |  | CODE IDENT ITEM |
| QTY PER DASH NO                |  | LIST OF MATERIALS                                       |  |                 |
| CONTRACT NUMBER                |  | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |  |                 |
| OR                             |  | FINAL ASSY.<br>VZC-6962G5<br>SERIES                     |  |                 |
| CHK                            |  | FSCM NO.<br>D 59782                                     |  |                 |
| APPO                           |  | 01008121                                                |  | B               |
| APPO                           |  | CLASS A                                                 |  | SHEET 2 OF 2    |
| DESIGN ACTIVITY APPROVAL       |  | SCALE -                                                 |  |                 |
| CUSTOMER APPROVAL              |  | SUPERSEDES                                              |  |                 |
| NEXT ASSEMBLY                  |  | CAD=11 01008121.B.SHT2                                  |  |                 |
| USED ON                        |  |                                                         |  |                 |
| APPLICATION                    |  |                                                         |  |                 |
| FINISH                         |  |                                                         |  |                 |

D

C

B

D 01008121

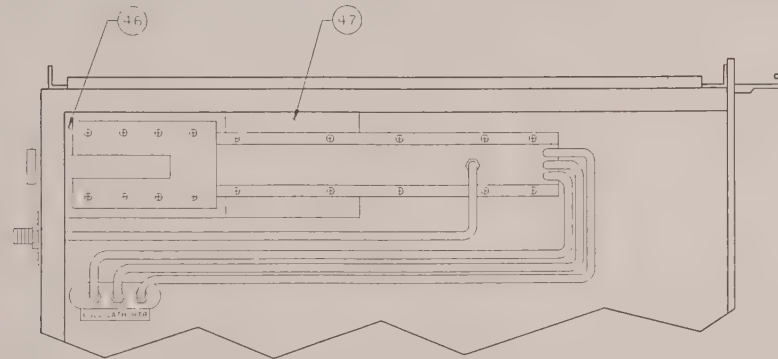
A





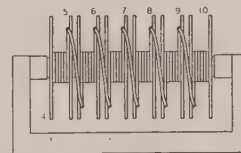






VIEW B

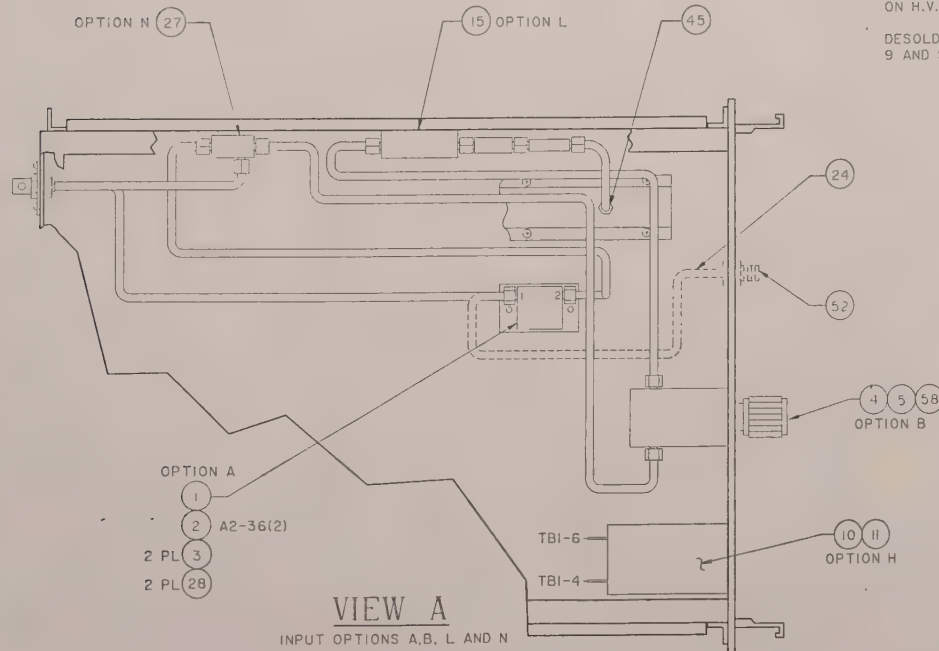
SHOWS TUBE POSITION WHEN THERE IS NO OPTION E, J OR M REQUIRED



VIEW C

ON H.V. TRANSFORMER:

DESOLDER BLUE WIRE FROM 9 AND SOLDER IT TO 10.



VIEW A

INPUT OPTIONS A, B, L AND N

| REVISIONS |     |                    |     |      |          |
|-----------|-----|--------------------|-----|------|----------|
| ZONE      | REV | DESCRIPTION        | ECO | DATE | APPROVED |
|           |     | SEE SHT 1 FOR REVS |     |      |          |

TABLE 1 - OPTIONS E, J AND M  
WAVEGUIDE, W/O CLAMPS, BRACKETS, COUPLERS

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO. | PART NO.  | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |   |   | NO E, J OR M |
|----------|-----------|----------------------------------|---|---|---|---|---|---|---|---|---|--------------|
|          |           | E                                | J | M | E | J | M | E | J | M | E |              |
| 29       | 135383-03 | -                                | - | - | - | - | - | 1 | 1 | 1 | 1 | -            |
| 29       | 135383-03 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -            |
| 30       | 135438-01 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -            |
| 31       | 135448-01 | 1                                | - | 1 | - | 1 | - | - | - | - | - | -            |
| 31       | 135448-01 | 1                                | - | 1 | - | 1 | - | - | - | - | - | -            |
| 32       | 13554-38  | -                                | - | - | - | - | - | 1 | 1 | 1 | 1 | -            |
| 32       | 13554-38  | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -            |
| 32       | 13554-38  | -                                | - | - | - | - | - | - | - | - | - | -            |
| 33       | 133720-04 | 1                                | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -            |
| 33       | 133720-05 | 1                                | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -            |
| 34       | 133719-02 | 4                                | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | -            |

\* SEE VIEW B

TABLE 2 - LOWER FRONT PANEL &amp; FRONT PANEL COVER PLATES - OPTIONS B, E, H, J

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO. | PART NO.  | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | NO B, E, H OR J |
|----------|-----------|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----------------|
|          |           | B                                | E | H | J | B | E | H | J | B | E | H | J | B | E | H | J |                 |
| 35       | 129811-20 | -                                | - | - | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | 1 | -               |
| 36       | 129811-9  | -                                | - | - | 1 | - | - | - | 1 | - | - | - | 1 | - | - | - | 1 | -               |
| 37       | 129053-00 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1               |
| 37       | 129053-02 | -                                | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-07 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-08 | 1                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-09 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-11 | 1                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-11 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 24051-1   | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 24051-24  | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 24051-34  | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-38 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-50 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-51 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-52 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-60 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 37       | 129053-68 | -                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |

TABLE 3 - REAR COVER PLATES, OPTIONS E, J, M, N

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA. ALLOCATE PARTS FROM THAT COLUMN.

| ITEM NO. | PART NO.  | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | NO E, J, M OR N |
|----------|-----------|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----------------|
|          |           | E                                | J | M | N | E | J | M | N | E | J | M | N | E | J | M | N |                 |
| 38       | 129811-00 | 1                                | - | - | - | 1 | 1 | 1 | 1 | - | - | - | - | 1 | 1 | 1 | 1 | -               |
| 38       | 129811-03 | -                                | 1 | 1 | - | - | - | - | - | 1 | 2 | 2 | - | - | - | - | - | -               |
| 39       | 129811-16 | -                                | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 2               |
| 39       | 129811-05 | -                                | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | -               |
| 40       | 129810-02 | -                                | - | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - | 1 | 1               |
| 40       | 129810-03 | 1                                | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | -               |
| 40       | 129810-05 | -                                | 1 | 1 | - | - | - | - | - | 1 | 1 | 1 | - | - | - | - | - | -               |
| 41       | 129810-07 | -                                | 1 | 1 | - | - | - | - | - | 1 | 1 | 1 | - | - | - | - | - | -               |

|                   |     |     |                                                         |             |            |      |
|-------------------|-----|-----|---------------------------------------------------------|-------------|------------|------|
| -02               | -01 | -00 | IDENTIFYING NUMBER                                      | DESCRIPTION | CODE IDENT | ITEM |
| QTY PER DASH NO   |     |     | LIST OF MATERIALS                                       |             |            |      |
| CONTRACT NUMBER   |     |     | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |             |            |      |
| DECIMALS (PL) 2PL |     |     | FINAL ASSY.<br>VZX-6983G5<br>SERIES                     |             |            |      |
| 3PL x             |     |     | FSCM NO. D 59782                                        |             |            |      |
| ANG x             |     |     | CLASS A                                                 |             |            |      |
| MATERIAL          |     |     | SHEET 2 OF 2                                            |             |            |      |
| NEXT ASSEMBLY     |     |     | SUPERSEDES                                              |             |            |      |
| USED ON           |     |     | SCALE                                                   |             |            |      |
| SPEC. NO.         |     |     | CLASS A                                                 |             |            |      |
| APPLICATION       |     |     | SHEET 2 OF 2                                            |             |            |      |
| FINISH            |     |     | SHEET 2 OF 2                                            |             |            |      |

D

C

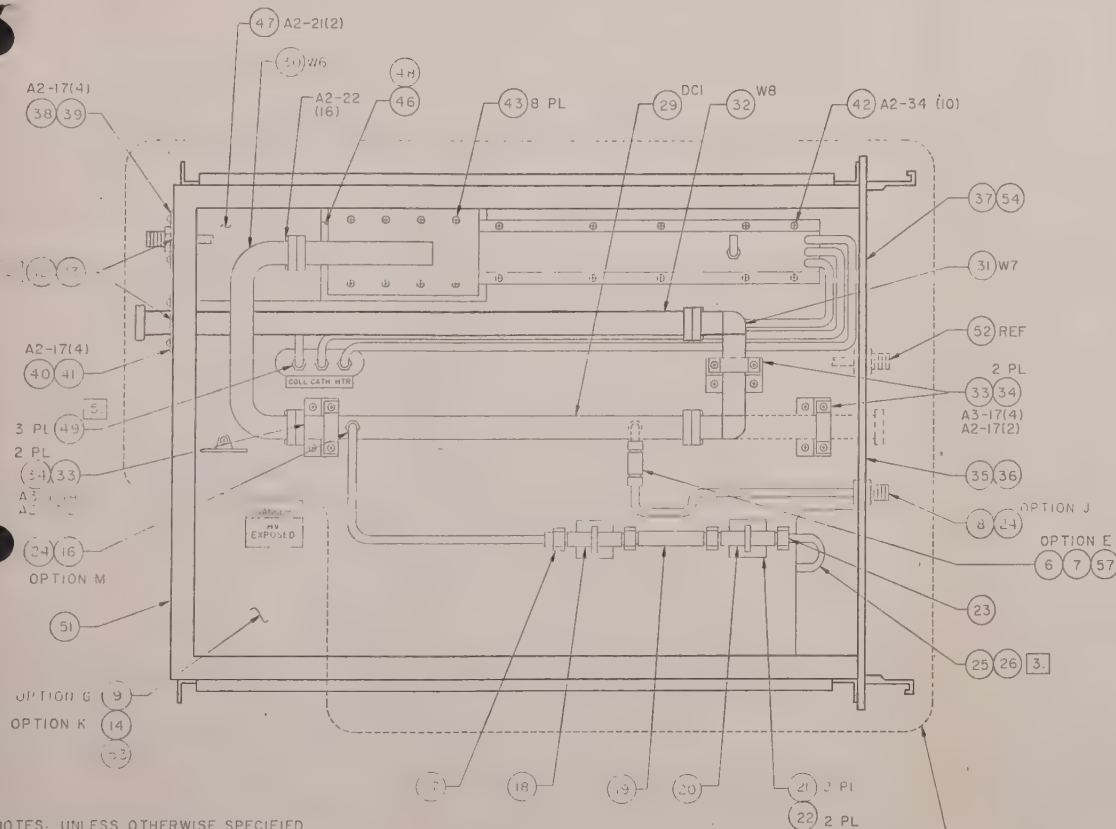
B

D101008122

A



| REVISIONS |     |                     |        |             |
|-----------|-----|---------------------|--------|-------------|
| ZONE      | REV | DESCRIPTION         | E.C.O. | DATE        |
| 1         | A   | MFG RELEASE/CLASS A | 27666  | 1/14/67 KCL |



NOTES: UNLESS OTHERWISE SPECIFIED

- WORKMANSHIP PER VARIAN STD 87-800299.
- PLACE LABELS UNDER INPUT AND OUTPUT PORTS.
- SEE JUMPER TABLES 113979 SHT 3 CR2 TO AIP4-8
- THE LETTERS OR NUMBERS WHICH FOLLOW THE MODEL NUMBER DEFINE THE OPTIONS. LETTERS DEFINE THE STANDARD OPTIONS DIRECTLY. NUMBERS DEFINE THE OPTIONS THROUGH A CORRESPONDING DRAWING

#### EXAMPLE:

- MODEL NUMBER VZU699265A1M IS A VZU699265 TWTA WITH AN INPUT ISOLATOR (A), OUTPUT SAMPLE PORT (E) AND VSWR PROTECTION (M)
- MODEL NUMBER VZU6992651XXX IS A VZU699265 TWTA WITH THE OPTIONS AND MODIFICATIONS SPECIFIED ON DRAWING NUMBER 01008123.
- COLLECTOR-RED, CATHODE-YELLOW, HTR BROWN SEE 113979 SHT 2 DETAIL A FOR IN ASSY INSTRUCTIONS
- TEST PER TEST SPECIFICATION 01008118

| STANDARD OPTIONS |                                    |
|------------------|------------------------------------|
| OPTION           | DESCRIPTION                        |
| A                | INPUT ISOLATOR                     |
| B                | INPUT ATTENUATOR                   |
| E                | OUTPUT SAMPLE PORT (FRONT TYPE)    |
| G                | REMOTE INTERFACE REAR SWITCH       |
| H                | ELAPSED TIME METER (FRONT)         |
| J                | FRONT RF CONNECTORS (INPUT OUTPUT) |
| K                | 230VAC BROWSE POWER                |
| L                | SOLID STATE AMPLIFIER              |
| M                | VSWR PROTECTION                    |
| N                | PIN DIODE SWITCH (REAR CONNECTOR)  |

| ZONE | REV    | DESCRIPTION                                              | E.C.O.                          | DATE        |
|------|--------|----------------------------------------------------------|---------------------------------|-------------|
| 1    | A      | MFG RELEASE/CLASS A                                      | 27666                           | 1/14/67 KCL |
| 2    | B      | 58-8000                                                  | SMA CONNECTOR                   | 58          |
| 1    | E      | 58-180 100                                               | SMA CONNECTOR                   | 57          |
| R    |        | 113850-00                                                | OUTLINE                         | 56          |
| R    |        | 0100817-00                                               | RF SCHEMATIC                    | 55          |
| I    |        | 112882-02                                                | SPACER, FRONT PANEL             | 54          |
| I    |        | 113979-18                                                | BASIC POWER SUPPLY              | 53          |
| I    |        | 58-18000                                                 | "N" INPUT BULKHEAD              | 52          |
| I    | K      | 112378-40                                                | LABEL, FACTORY WIRED FOR 230VAC | 51          |
|      |        |                                                          |                                 | 50          |
| 3    |        | 58-18000                                                 | CONNECTOR, H.V.                 | 49          |
| AR   |        | 68-298900                                                | HEATSINK COMPOUND               | 48          |
| I    |        | 129709-00                                                | TUBE PLATE                      | 47          |
| I    |        | 113999-00                                                | HEATSINK                        | 46          |
| I    |        | 58-18000                                                 | INPUT CONNECTOR, SMA            | 45          |
|      |        |                                                          |                                 | 44          |
| B    |        | 12-222008-24                                             | SCREW PAN HD, 48-32 X 1 1/2     | 43          |
| I    |        | V7U-629071                                               | TWT                             | 42          |
| R    |        | SEE TABLE 3                                              | REAR COVER PLATE                | 41          |
| R    |        | SEE TABLE 3                                              | REAR COVER PLATE                | 40          |
| R    |        | SEE TABLE 3                                              | REAR COVER PLATE                | 39          |
| R    |        | SEE TABLE 3                                              | REAR COVER PLATE                | 38          |
| R    |        | SEE TABLE 2                                              | LOWER FRONT PANEL               | 37          |
| R    |        | SEE TABLE 2                                              | FRONT COVER PLATE               | 36          |
| R    |        | SEE TABLE 2                                              | FRONT COVER PLATE               | 35          |
| R    |        | SEE TABLE 1                                              | CLAMP, WAVEGUIDE                | 34          |
| R    |        | SEE TABLE 1                                              | WAVEGUIDE                       | 33          |
| R    |        | SEE TABLE 1                                              | WAVEGUIDE                       | 32          |
| R    |        | SEE TABLE 1                                              | WAVEGUIDE                       | 31          |
| R    |        | SEE TABLE 1                                              | WAVEGUIDE                       | 30          |
| R    | E.M.   | SEE TABLE 1 (DO)                                         | COUPLER                         | 29          |
| 2    | A      | 58-180100                                                | SMA CONNECTOR                   | 28          |
| I    | N      | 01008031-00                                              | PIN DIODE KIT                   | 27          |
| I    | M      | 51-40710                                                 | CONTACT FOR AIP4-8              | 26          |
| AR   | M      | 82-100188                                                | CABLE, COAX RG8B/U              | 25          |
| AR   | E.M.   | 82-299502                                                | CABLE, COAX 141                 | 24          |
| I    | M      | 58-180107                                                | SMA TO RG8B/U                   | 23          |
| 2    | M      | 22-186550                                                | CABLE TIE                       | 22          |
| 2    | M      | 22-186503                                                | MOUNT, CABLE TIE                | 21          |
| I    | M      | 83-45000                                                 | DETECTOR                        | 20          |
| I    | M      | 83-460014                                                | FILTER                          | 19          |
| I    | M      | 83-439885                                                | ATTENUATOR, 10 DB               | 18          |
| I    | M      | 58-180117                                                | SMA JACK                        | 17          |
| I    | M      | 58-180100                                                | SMA PLUG, 141 CABLE             | 16          |
| I    | L      | 01004173-06                                              | SSA KIT                         | 15          |
| I    | K      | SEE 113979 SHT 3 NOTE 2                                  | 230VAC WIRING                   | 14          |
| I    |        | SEE NOTE 2                                               | LABEL, RE OUT                   | 13          |
| I    |        | SEE NOTE 2                                               | LABEL, RE IN                    | 12          |
| I    | H      | 1 H.M. 4 FOR FREQUENCY                                   | E.T. METER 60 HZ                | 11          |
| I    | H      | 2 SEE 113979 SHT 3, NOTE 6 FOR INSTALLATION INSTRUCTIONS | E.T. METER 50 HZ                | 10          |
| I    | G      | 13518-00                                                 | REMOTE CONTROL OPTION KIT       | 9           |
| I    | E      | 58-180100                                                | "N" BULK HEAD                   | 8           |
| I    | E      | 58-180201                                                | ADAPTER, RT ANGLE               | 7           |
|      |        |                                                          |                                 | 6           |
| I    | B      | 83-439946                                                | INPUT ATTENUATOR                | 5           |
| I    | B      | 23-508002                                                | KNOB                            | 4           |
| 2    | A      | 12-210202-04                                             | SCREW, FLAT HD, 42-56 X 1/4     | 3           |
| I    | A      | 01006661                                                 | ISOLATOR SUPPORT PLATE          | 2           |
| I    | A      | 83-46341-5                                               | INPUT ISOLATOR                  | 1           |
| QTY  | OPTION | MFG NUMBER                                               | DESCRIPTION                     | ITEM        |

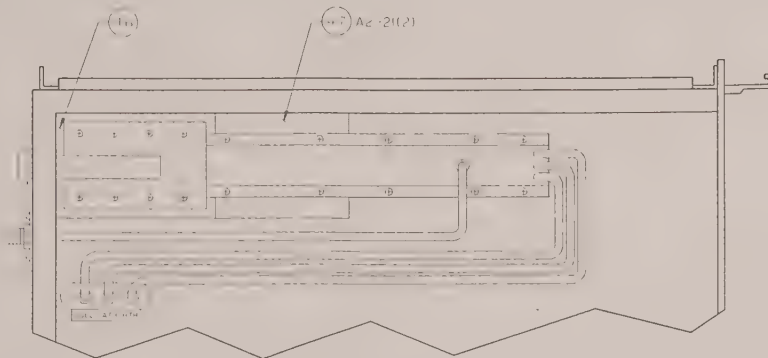
|                                                          |            |                       |       |                   |       |
|----------------------------------------------------------|------------|-----------------------|-------|-------------------|-------|
| UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES |            | DRAWN BY: K. CARTER   |       | DATE: 10/6/66     |       |
| DECIMALS: 1/16                                           | 1/32       | 1/64                  | 1/128 | 1/256             | 1/512 |
| 3PL: QDS                                                 | FRAC: 1/64 | 1/32                  | 1/64  | 1/128             | 1/256 |
| ANG: 1                                                   | 2          | 3                     | 4     | 5                 | 6     |
| MATERIAL: VZU-699265                                     |            | APPROVED: [Signature] |       | DATE: 12/4/66     |       |
| NEXT ASSEMBLY: USED ON                                   |            | SPEC. NO.             |       | CUSTOMER APPROVAL |       |
| APPLICATION: FINISH                                      |            | SCALE: 1" = 1"        |       | CLASS: A          |       |
| SUPERSEDES: 01008118                                     |            | FORM NO. 01008123     |       | SHEET 1 OF 2      |       |

FINAL ASSY.  
VZU-699265  
SERIES

01008123 A

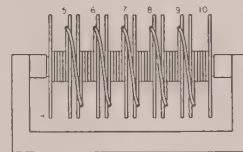






VIEW B

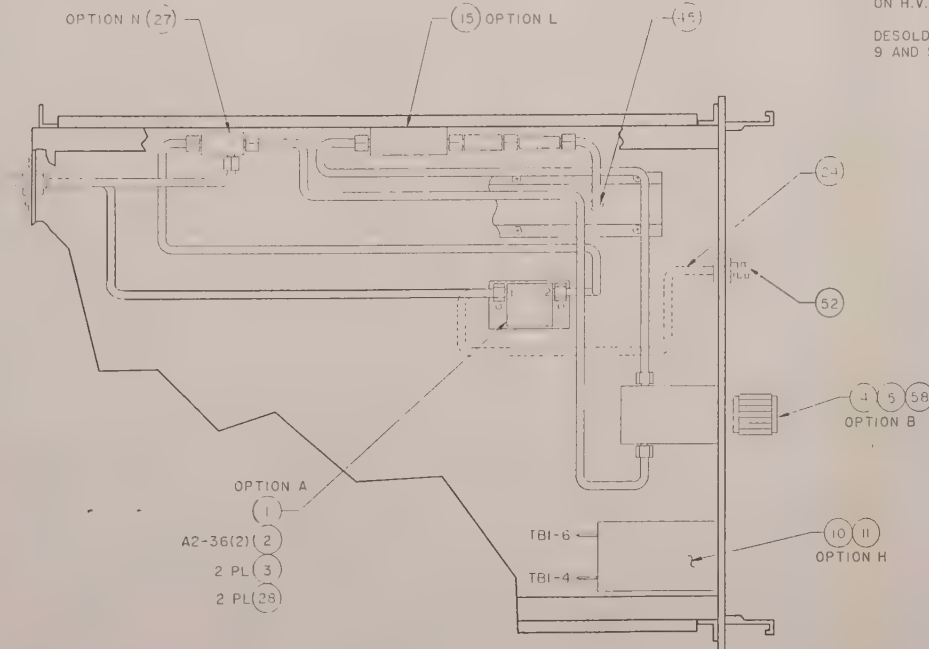
SHOWS TUBE POSITION WHEN THERE IS  
NO OPTION E, M, OR J REQUIRED



VIEW C

ON H.V. TRANSFORMER

DESOLDER BLUE WIRE FROM  
9 AND SOLDER IT TO 10.



VIEW A

INPUT OPTIONS A, B, L AND N

| REVISIONS          |     |             |     |      |
|--------------------|-----|-------------|-----|------|
| ZONE               | REV | DESCRIPTION | ECD | DATE |
| SEE SHT 1 FOR REVS |     |             |     |      |

TABLE 1 - OPTIONS E, J AND M  
WAYGUIDE, W/G CLAMPS, BRACKETS, COUPLERS

CHOOSE THE COLUMN WHICH INCLUDES THE MOST  
OPTIONS IN THE TWTA. ALLOCATE PARTS FROM  
THAT COLUMN

| PART CODE |           | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |   |   |   |   | NO. E OR M |
|-----------|-----------|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|------------|
| ITEM NO   | PART NO.  | E                                | J | M | E | J | M | E | J | M | E | J | M | E OR M     |
| 29        | 135393-02 | -                                | - | - | 1 | 1 | 1 | - | - | - | - | - | - | -          |
| 29        | 135393-00 | 1                                | 1 | 1 | - | - | - | - | - | - | - | - | - | -          |
| 30        | 135436-00 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -          |
| 31        | 135446-00 | -                                | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -          |
| 31        | 103354-35 | 1                                | 1 | 1 | - | - | - | - | - | - | - | - | - | -          |
| 31        | 103354-38 | 1                                | 1 | 1 | - | - | - | - | - | - | - | - | - | -          |
| 33        | 133720-02 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -          |
| 33        | 133720-03 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -          |
| 34        | 133720-04 | 1                                | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -          |
| 32        | 135437    | -                                | - | - | - | - | - | - | - | - | - | - | - | -          |

\* SEE VIEW B

TABLE 2 - LOWER FRONT PANEL & FRONT PANEL  
COVER PLATES - OPTIONS B, E, H, J

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA.  
ALLOCATE PARTS FROM THAT COLUMN

| ITEM<br>NO. | PART NO.  | OPTION COMBINATIONS |   |   |   |   |   |   |   |   |   | QUANTITIES |   |   |  | NO B, E,<br>H OR J |
|-------------|-----------|---------------------|---|---|---|---|---|---|---|---|---|------------|---|---|--|--------------------|
|             |           | B                   | E | H | J | B | E | H | J | B | E | H          | J |   |  |                    |
| 35          | 129053-01 | 1                   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 |  |                    |
| 36          | 129053-24 | 1                   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 |  |                    |
| 37          | 129053-30 | -                   | - | - | - | - | - | - | - | - | - | -          | - | 1 |  |                    |
| 37          | 129053-02 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-07 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-08 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-09 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-11 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-18 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-17 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-14 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-34 | 1                   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 |  |                    |
| 37          | 129053-38 | 1                   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 |  |                    |
| 37          | 129053-50 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-51 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-52 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-60 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |
| 37          | 129053-68 | -                   | - | - | - | - | - | - | - | - | - | -          | - | - |  |                    |

TABLE 3 - REAR COVER PLATES, OPTIONS E, J, M, N

CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA.  
ALLOCATE PARTS FROM THAT COLUMN

| ITEM NO. |           | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |   |   |   |   | NO. E, J, M OR N |   |   |   |
|----------|-----------|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|------------------|---|---|---|
| PART NO. |           | E                                | J | M | N | E | J | M | N | E | J | M | N | E                | J | M | N |
| 38       | 129810-00 | 1                                | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -                | - | - | - |
| 38       | 129810-03 | -                                | 1 | 1 | - | - | 1 | 2 | 2 | - | - | 2 | - | -                | - | - | - |
| 39       | 133076    | -                                | - | - | 1 | - | - | - | - | - | - | - | - | -                | - | - | 1 |
| 39       | 129810-05 | -                                | 1 | 1 | - | - | 1 | - | - | - | - | - | - | -                | - | - | - |
| 40       | 129810-02 | -                                | - | 1 | - | - | 1 | - | - | - | 1 | 1 | - | 1                | 1 | - | - |
| 40       | 129810-03 | 1                                | - | - | 1 | 1 | - | - | 1 | 1 | - | - | - | -                | - | - | - |
| 40       | 129810-04 | -                                | 1 | 1 | - | - | 1 | 1 | 1 | - | - | - | - | -                | - | - | - |
| 41       | 129810-07 | -                                | 1 | 1 | - | - | 1 | 1 | 1 | - | - | - | 1 | -                | - | - | - |

| -02 | -01 | -00 | IDENTIFYING NUMBER | DESCRIPTION | CODE IDENT ITEM |
|-----|-----|-----|--------------------|-------------|-----------------|
|-----|-----|-----|--------------------|-------------|-----------------|

QTY PER DRAWING

CONTRACT NUMBER

DECIMALS: 1 PL, 1 2 PL

FRACTION: 1/64

ANG. 1/2

MATERIAL

FINISH

APPROVAL

DESIGN ACTIVITY APPROVAL

CUSTOMER APPROVAL

SCALE

SUPERSEDES

LIST OF MATERIALS

varian

MICROWAVE EQUIPMENT DIVISION

SANTA CLARA, CALIFORNIA

FINAL ASSY.

VZU-6992G5

SERIES

SIZE

FSCM NO.

D 59782

CLASS A

SHEET 2 OF 2

D

C

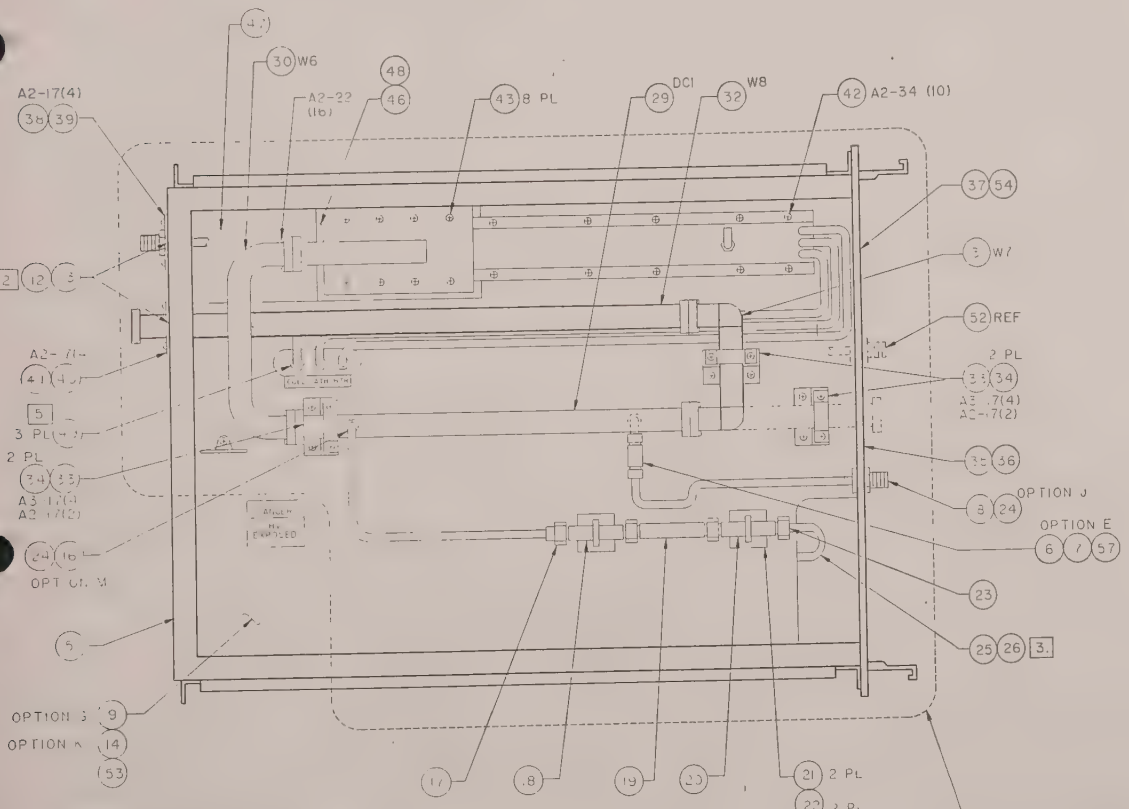
B

D 01008123

A



| REVISIONS |     | ECO         |  | DATE              |  | APPROVED |  |
|-----------|-----|-------------|--|-------------------|--|----------|--|
| ZONE      | REV | DESCRIPTION |  | MFG RELEASE/CLASS |  | A        |  |
|           | A   |             |  | 2/14/66           |  | 1/16/81  |  |



NOTES: UNLESS OTHERWISE SPECIFIED

- WORKMANSHIP PER VARIAN STD 97-800299
- PLACE LABELS UNDER INPUT AND OUTPUT PORTS
- SEE JUMPER TABLES 113979 SHEET 3 CR2 TO AIP4-B
- THE LETTERS OR NUMBERS WHICH FOLLOW THE MODEL NUMBER DEFINE THE OPTION. LETTERS DEFINE THE STANDARD OPTIONS DIRECTLY. NUMBERS DEFINE THE OPTIONS THROUGH A CORRESPONDING DRAWING

#### EXAMPLE

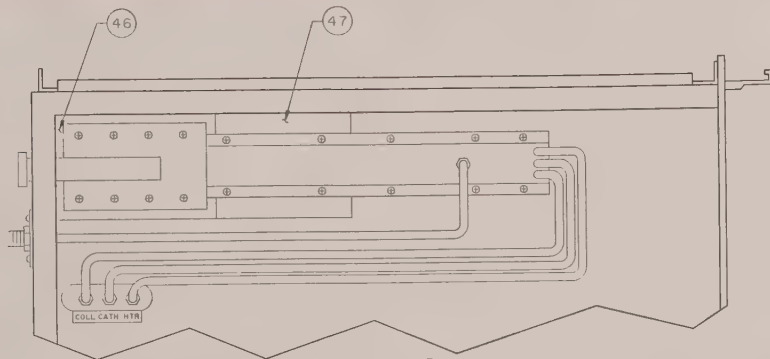
- MODEL NUMBER VZM6992G6ALM IS A VZM6992G6 TWT WITH AN INPUT ISOLATOR (A), OUTPUT SAMPLE PORT (E) AND VSWR PROTECTION (M)
- MODEL NUMBER VZM6992G6IXXX IS A VZM6992G6 TWT WITH THE OPTIONS AND MODIFICATIONS SPECIFIED ON DRAWING NUMBER 01008124
- COLLECTOR=RED, CATHODE=YELLOW, HTR=BROWN SEE 13979 SHEET 2 DETAIL A FOR IN ASSY INSTRUCTIONS
- TEST PER TEST SPECIFICATION 01008124

| STANDARD OPTIONS |                                      |
|------------------|--------------------------------------|
| OPTION           | DESCRIPTION                          |
| A                | INPUT ISOLATOR                       |
| B                | INPUT ATTENUATOR                     |
| E                | OUTPUT SAMPLE PORT (A-PORT "M" TYPE) |
| G                | REMOTE INTERACT. REAR SWITCH         |
| H                | ELAPSED TIME METER (FRONT)           |
| J                | FRONT RF CONNECTORS (INPUT/OUTPUT)   |
| K                | 230VAC OR NE POWER                   |
| L                | SOLID STATE AMPLIFIER                |
| M                | VSWR PROTECT ON                      |
| N                | PIN DIODE SWITCH (REAR CONNECTOR)    |

|                          |  |                              |  |                              |  |
|--------------------------|--|------------------------------|--|------------------------------|--|
| VZM-6992G6               |  | SPEC NO.                     |  | CUSTOMER APPROVAL            |  |
| APPLICATION              |  | FINISH                       |  | SCALE - CLASS A SHEET 1 OF 2 |  |
| NEXT ASSEMBLY USED ON    |  | DATE                         |  | SUPERSEDES                   |  |
| MATERIAL                 |  | DRAWN                        |  | CHECKED                      |  |
| APPROVED                 |  | DATE                         |  | DATE                         |  |
| DESIGN ACTIVITY APPROVAL |  | DATE                         |  | DATE                         |  |
| VARIAN                   |  | MICROWAVE EQUIPMENT DIVISION |  | SANTA CLARA, CALIFORNIA      |  |
| FINAL ASSY.              |  | VZM-6992G6                   |  | SERIES                       |  |
| D 59782                  |  | 01008124                     |  | A                            |  |
| SCALE - CLASS A          |  | SHEET 1 OF 2                 |  | SUPERSEDES                   |  |
| CAO= 11 01008124 A.SHT1  |  |                              |  |                              |  |

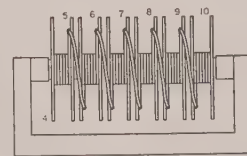
|    |   |             |                                 |      |
|----|---|-------------|---------------------------------|------|
| 2  | B | 58-18000    | SMA CONNECTOR                   | 58   |
| 1  | E | 58-180 100  | SMA CONNECTOR                   | 57   |
|    |   | 113950-00   | OUTLINE                         | 56   |
| B  |   | 01008124-00 | RF SCHEMATIC                    | 55   |
| I  |   | 112882-02   | SPACER, FRONT PANEL             | 54   |
| I  |   | 113979-B    | BASIC POWER SUPPLY              | 53   |
| I  |   | 58-18000    | "M" INPUT BULKHEAD              | 52   |
| I  | K | 112378-40   | LABEL, FACTORY WIRED FOR 230VAC | 51   |
|    |   | 51-14051    | CONNECTOR, H.V.                 | 50   |
| 3  |   | 113993-00   | HEAT SINK COMPOUND              | 49   |
| AR |   | 112909-00   | TUBE PLATE                      | 48   |
| I  |   | 113993-00   | HEAT SINK                       | 47   |
| I  |   | 58-18000    | INPUT CONNECTOR, SMA            | 46   |
|    |   | 12-12008-24 | SCREW PAN. HD. #8 32 X 1 1/2    | 45   |
| I  |   | 112378-40   | TWT                             | 44   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 43   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 42   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 41   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 40   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 39   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 38   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 37   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 36   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 35   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 34   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 33   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 32   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 31   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 30   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 29   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 28   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 27   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 26   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 25   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 24   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 23   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 22   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 21   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 20   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 19   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 18   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 17   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 16   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 15   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 14   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 13   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 12   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 11   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 10   |
| R  |   | 112980-XX   | REAR COVER PLATE                | 9    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 8    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 7    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 6    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 5    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 4    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 3    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 2    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 1    |
| R  |   | 112980-XX   | REAR COVER PLATE                | 0    |
| R  |   | 112980-XX   | REAR COVER PLATE                | -1   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -2   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -3   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -4   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -5   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -6   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -7   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -8   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -9   |
| R  |   | 112980-XX   | REAR COVER PLATE                | -10  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -11  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -12  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -13  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -14  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -15  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -16  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -17  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -18  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -20  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -21  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -23  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -24  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -25  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -26  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -27  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -28  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -29  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -30  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -31  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -32  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -34  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -35  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -38  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -40  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -41  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -43  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -44  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -45  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -46  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -47  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -48  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -49  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -50  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -51  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -52  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -53  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -54  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -55  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -56  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -57  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -58  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -59  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -60  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -62  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -63  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -64  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -65  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -66  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -67  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -68  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -69  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -70  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -73  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -74  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -75  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -77  |
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| R  |   | 112980-XX   | REAR COVER PLATE                | -87  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -88  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -89  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -90  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -91  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -92  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -93  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -94  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -95  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -96  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -97  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -98  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -99  |
| R  |   | 112980-XX   | REAR COVER PLATE                | -100 |





VIEW B

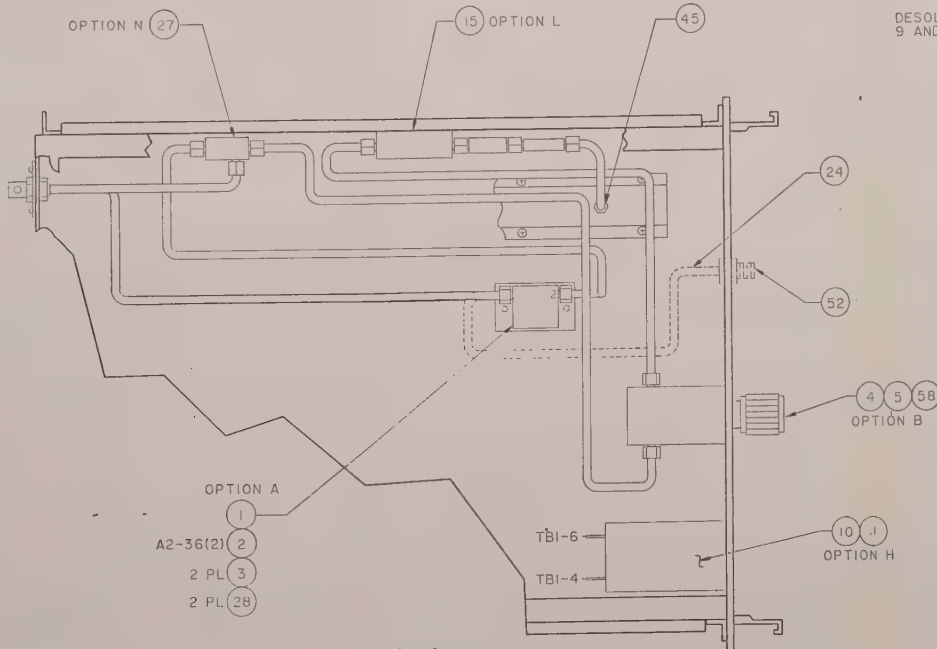
SHOWS TUBE POSITION WHEN THERE IS  
NO OPTION E, J OR M REQUIRED



VIEW C

ON H.V. TRANSFORMER:

DESOLDER BLUE WIRE FROM  
9 AND SOLDER IT TO 10.



VIEW A

INPUT OPTIONS A, B, L AND N

| REVISIONS          |     |             |     |      |
|--------------------|-----|-------------|-----|------|
| ZONE               | REV | DESCRIPTION | ECO | DATE |
| SEE SHT 1 FOR REVS |     |             |     |      |
| APPROVED           |     |             |     |      |

| TABLE 1 - OPTIONS E, J AND M<br>WAVEGUIDE W/O CLAMPS, BRACKETS, COUPLERS                              |             |                             |   |   |   |   |   |   |   |
|-------------------------------------------------------------------------------------------------------|-------------|-----------------------------|---|---|---|---|---|---|---|
| CHOOSE THE COLUMN WHICH INCLUDES THE MOST<br>OPTIONS IN THE TWTA. ALLOCATE PARTS FROM<br>THAT COLUMN. |             |                             |   |   |   |   |   |   |   |
| ITEM<br>NO.                                                                                           | PART NO.    | OPTION COMBINATIONS & QTY'S |   |   |   |   |   |   |   |
|                                                                                                       |             | E                           | J | M | E | J | M | E | J |
| 29                                                                                                    | 00-36079-00 | -                           | - | - | 1 | - | 1 | - | - |
| 29                                                                                                    | 00-36079-01 | 1                           | - | 1 | 1 | - | 1 | - | - |
| 30                                                                                                    | 01006078-00 | 1                           | 1 | 1 | 1 | 1 | 1 | 1 | - |
| 31                                                                                                    | 01006077-00 | 1                           | 1 | 1 | 1 | 1 | 1 | 1 | - |
| 31                                                                                                    | 00-03354-41 | -                           | - | 1 | 1 | 1 | 1 | - | - |
| 32                                                                                                    | 00-03354-42 | 1                           | 1 | 1 | 1 | 1 | 1 | - | - |
| 32                                                                                                    | 00-03354-40 | -                           | 1 | - | - | - | - | - | - |
| 33                                                                                                    | 00-03370-01 | 1                           | 2 | 1 | 1 | 1 | 1 | 1 | - |
| 33                                                                                                    | 00-03370-02 | 1                           | 1 | 1 | 1 | 1 | 1 | 1 | - |
| 34                                                                                                    | 00-03379-02 | 4                           | 4 | 4 | 4 | 4 | 4 | 4 | - |

\* SEE VIEW B

| TABLE 2 - LOWER FRONT PANEL & FRONT PANEL<br>COVER PLATES - OPTIONS B, E, H, J                     |           |                                  |   |   |   |   |   |   |   |
|----------------------------------------------------------------------------------------------------|-----------|----------------------------------|---|---|---|---|---|---|---|
| CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA.<br>ALLOCATE PARTS FROM THAT COLUMN. |           |                                  |   |   |   |   |   |   |   |
| ITEM<br>NO.                                                                                        | PART NO.  | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |
|                                                                                                    |           | B                                | E | H | J | B | E | H | J |
| 35                                                                                                 | 129811-19 | -                                | - | 1 | 1 | 1 | 1 | 1 | 1 |
| 36                                                                                                 | 129811-18 | -                                | - | 1 | 1 | 1 | 1 | 1 | 1 |
| 37                                                                                                 | 129053-00 | -                                | - | - | - | - | - | - | - |
| 37                                                                                                 | 129053-02 | -                                | - | 1 | - | - | - | - | - |
| 37                                                                                                 | 129053-07 | -                                | - | 1 | - | - | - | - | - |
| 37                                                                                                 | 129053-08 | -                                | - | - | - | - | - | - | - |
| 37                                                                                                 | 129053-09 | -                                | - | - | 1 | - | - | - | - |
| 37                                                                                                 | 129053-11 | 1                                | - | - | - | - | - | - | - |
| 37                                                                                                 | 129053-18 | -                                | - | - | 1 | - | - | - | - |
| 37                                                                                                 | 129053-21 | -                                | - | - | - | 1 | - | - | - |
| 37                                                                                                 | 129053-24 | -                                | - | 1 | - | - | - | - | - |
| 37                                                                                                 | 129053-34 | -                                | - | - | 1 | - | - | - | - |
| 37                                                                                                 | 129053-38 | -                                | - | - | - | 1 | - | - | - |
| 37                                                                                                 | 129053-50 | -                                | - | - | - | 1 | - | - | - |
| 37                                                                                                 | 129053-51 | -                                | - | - | - | - | 1 | - | - |
| 37                                                                                                 | 129053-52 | -                                | - | - | - | - | - | 1 | - |
| 37                                                                                                 | 129053-60 | -                                | - | - | - | - | - | - | 1 |
| 37                                                                                                 | 129053-68 | -                                | - | - | - | - | - | - | 1 |

| TABLE 3 - REAR COVER PLATES, OPTIONS E, J, M, N                                                    |           |                                  |   |   |   |   |   |   |   |
|----------------------------------------------------------------------------------------------------|-----------|----------------------------------|---|---|---|---|---|---|---|
| CHOOSE THE COLUMN WHICH INCLUDES THE MOST OPTIONS IN THE TWTA.<br>ALLOCATE PARTS FROM THAT COLUMN. |           |                                  |   |   |   |   |   |   |   |
| ITEM<br>NO.                                                                                        | PART NO.  | OPTION COMBINATIONS & QUANTITIES |   |   |   |   |   |   |   |
|                                                                                                    |           | J                                | E | M | N | J | E | M | N |
| 38                                                                                                 | 129811-00 | 1                                | - | 1 | 1 | 1 | 1 | 1 | 1 |
| 38                                                                                                 | 129811-03 | -                                | 1 | 1 | - | 1 | 2 | 2 | - |
| 38                                                                                                 | 133078    | -                                | - | 1 | - | - | - | - | 1 |
| 39                                                                                                 | 129811-05 | -                                | 1 | 1 | - | 1 | - | - | - |
| 40                                                                                                 | 129810-02 | -                                | - | 1 | - | - | - | 1 | 1 |
| 40                                                                                                 | 129810-03 | 1                                | - | - | 1 | - | - | 1 | - |
| 40                                                                                                 | 129810-09 | -                                | 1 | - | - | - | 1 | - | - |
| 41                                                                                                 | 129810-07 | -                                | 1 | 1 | - | - | 1 | 1 | - |

|                                                        |  |                              |             |            |      |
|--------------------------------------------------------|--|------------------------------|-------------|------------|------|
| -02 -01 -00                                            |  | IDENTIFYING NUMBER           | DESCRIPTION | CODE IDENT | ITEM |
| QTY PER DASH NO                                        |  | LIST OF MATERIALS            |             |            |      |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES |  | CONTRACT NUMBER              |             |            |      |
| DECIMALS: 1 PL 1 2 PL 2                                |  | OR                           |             |            |      |
| 3 PL 1                                                 |  | CHK                          |             |            |      |
| ANG: °                                                 |  | APPD                         |             |            |      |
| MATERIAL                                               |  | APPD                         |             |            |      |
| NEXT ASSEMBLY                                          |  | DESIGN ACTIVITY APPROVAL     |             |            |      |
| USED ON                                                |  | CUSTOMER APPROVAL            |             |            |      |
| APPLICATION                                            |  | SIZE                         |             |            |      |
| FINISH                                                 |  | PSCM NO.                     |             |            |      |
|                                                        |  | D 59782                      |             |            |      |
|                                                        |  | 01008124                     |             |            |      |
|                                                        |  | A                            |             |            |      |
|                                                        |  | SCALE - CLASS A SHEET 2 OF 2 |             |            |      |
|                                                        |  | SUPERSEDES                   |             |            |      |

D

C

B

A

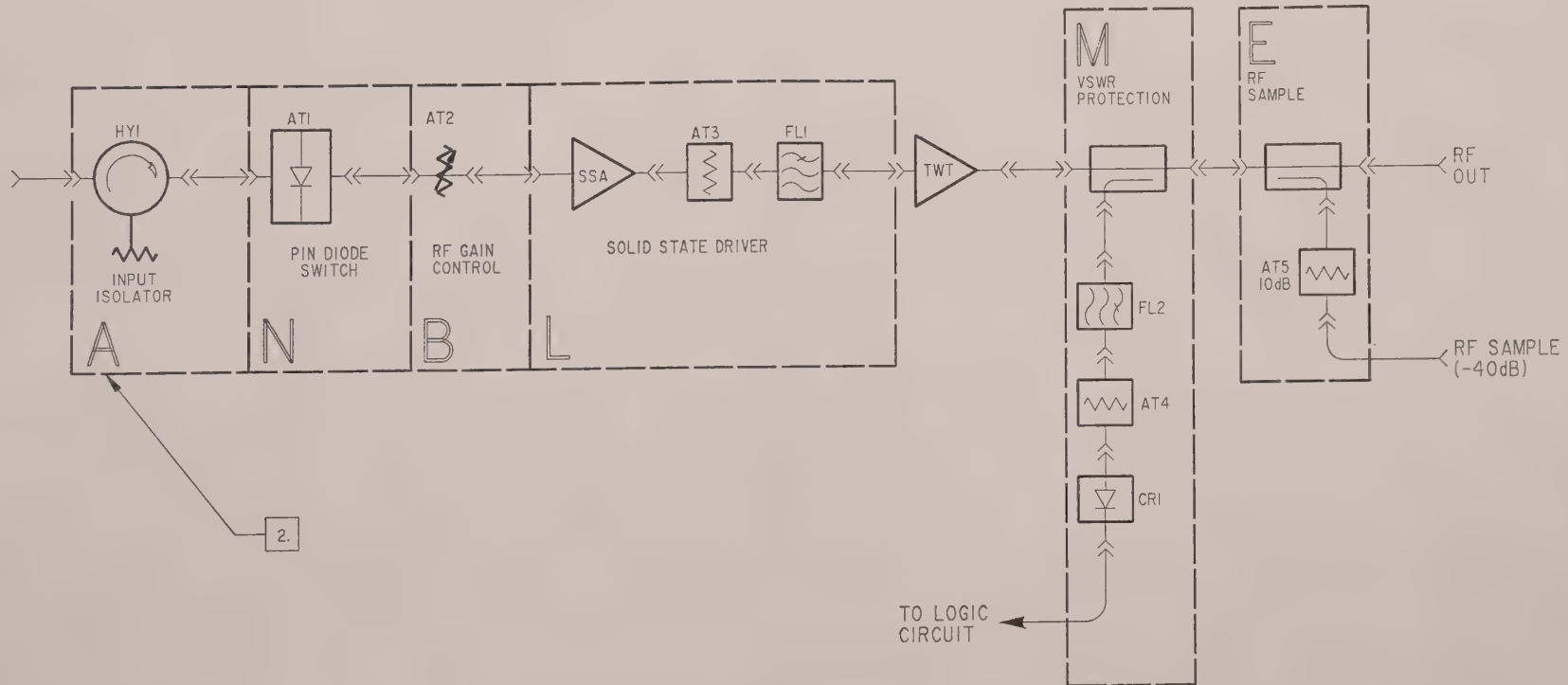
D 01008124

varian  
MICROWAVE EQUIPMENT DIVISION  
SANTA CLARA, CALIFORNIA  
FINAL ASSY.  
VZM-6992G6  
SERIES





| REVISIONS |     |                     |       |         |
|-----------|-----|---------------------|-------|---------|
| ZONE      | REV | DESCRIPTION         | ECO   | DATE    |
|           | A   | MFG RELEASE/CLASS B | 27566 | 1/16/87 |



NOTES: UNLESS OTHERWISE SPECIFIED

1. AT3, AT4 VALUES ARE DETERMINED IN TEST.

2. LETTERS REFER TO OPTION DESIGNATION IN MODEL NO.

| -02                                                    |  |  | -01 |  |  | -00 |  |  | IDENTIFYING NUMBER                                                                         |  |  | DESCRIPTION                                                                                         |  |  | CODE IDENT                                              |  |  | ITEM |  |  |
|--------------------------------------------------------|--|--|-----|--|--|-----|--|--|--------------------------------------------------------------------------------------------|--|--|-----------------------------------------------------------------------------------------------------|--|--|---------------------------------------------------------|--|--|------|--|--|
| QTY PER DASH NO                                        |  |  |     |  |  |     |  |  | LIST OF MATERIALS                                                                          |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES |  |  |     |  |  |     |  |  | CONTRACT<br>NUMBER                                                                         |  |  |  <b>varian</b> |  |  | MICROWAVE EQUIPMENT DIVISION<br>SANTA CLARA, CALIFORNIA |  |  |      |  |  |
|                                                        |  |  |     |  |  |     |  |  |                                                                                            |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |
| DEC:1PL±.1 2PL±.02                                     |  |  |     |  |  |     |  |  | DR K.CARTER                                                                                |  |  | 11/20/86                                                                                            |  |  | RF SCHEMATIC 100/200W<br>TWTA COAX MODELS               |  |  |      |  |  |
| 3PL±.005 FRAC:1/64                                     |  |  |     |  |  |     |  |  | CHK                                                                                        |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |
| ANG:1° SURFACE FINISH                                  |  |  |     |  |  |     |  |  | APPD  |  |  | 12/2/86                                                                                             |  |  |                                                         |  |  |      |  |  |
| MATERIAL                                               |  |  |     |  |  |     |  |  | APPD  |  |  | 12-2-86                                                                                             |  |  | SIZE FSCM NO. REV<br>B 59782 01008339 A                 |  |  |      |  |  |
|                                                        |  |  |     |  |  |     |  |  | DESIGN ACTIVITY APPROVAL                                                                   |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |
| 0/200W                                                 |  |  |     |  |  |     |  |  | CUSTOMER APPROVAL                                                                          |  |  | SCALE - CLASS B SHEET 1 OF 1                                                                        |  |  |                                                         |  |  |      |  |  |
| SED ON                                                 |  |  |     |  |  |     |  |  |                                                                                            |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |
| FINISH                                                 |  |  |     |  |  |     |  |  |                                                                                            |  |  |                                                                                                     |  |  |                                                         |  |  |      |  |  |

CAD= 11.01008339.A

SUPERSEDES

|                                                                                              |          |                              |              |
|----------------------------------------------------------------------------------------------|----------|------------------------------|--------------|
|  varian |          | MICROWAVE EQUIPMENT DIVISION |              |
|                                                                                              |          | SANTA CLARA, CALIFORNIA      |              |
| RF SCHEMATIC 100/200W                                                                        |          |                              |              |
| TWTA COAX MODELS                                                                             |          |                              |              |
| SIZE                                                                                         | FSCM NO. |                              | REV.         |
| B                                                                                            | 59782    | 01008339                     | A            |
| SCALE                                                                                        | -        | CLASS B                      | SHEET 1 OF 1 |







# HIGH VOLTAGE EQUIPMENT PERSONNEL OPERATING GUIDELINES

## 1.0 INTRODUCTION

This guideline document presents operating practices for operators and technicians who work with high voltage equipment. In the context of this discussion any voltage that is lethal is viewed as "high voltage". Therefore, even prime power (115 to 440 VAC) is dangerous because prime power potentials have been known to cause death or injury. (See Section 2.0)

### THERE ARE NO OLD CARELESS HIGH VOLTAGE TECHNICIANS

Electrical circuits operate quickly and do not allow a careless individual a second chance. When dealing with high voltage, the results are very consistent and predictable and hazards associated with high voltage are always present. THE FACT THAT THE CONTROL SWITCH SAYS OFF DOES NOT MEAN YOU ARE SAFE. Many high voltage circuits are like loaded guns. IN GENERAL, YOU CANNOT SEE A HIGH VOLTAGE HAZARD. You can learn to recognize situations that present a threat and how to avoid them.

The guidelines presented in this guide are not academic. They are based on the experience of engineers and technicians who have years of experience with high voltage circuits.

## 2.0 WHEN IS VOLTAGE "HIGH"?

As stated earlier, any voltage that will kill you should be treated as "high voltage". Voltages associated with prime power generally do not jump the air gap between people and the equipment. Usually exposed circuit elements such as a terminal, bare piece of wire, or some other non-insulated surface must be touched. One of the problems associated with prime power is that some equipment can be "floating" above ground. In this case, if you place one hand on the equipment chassis and the other on on



earth ground you can be jolted, injured or killed. 440 VAC can stimulate an involuntary muscle response that will either literally throw you across a room or seize and hold you across the voltage terminals. 600 or more volts can hold you indefinitely. If the potential is sufficient to drive 200 milliamps through your body you will be held indefinitely. Some people consider the 200 to 600 volt range to be worse than potentials of thousands of volts.

### 3.0 GENERAL GUIDELINES

In addition to the above, the following practices have proven effective for personnel who deal with high voltage equipment.

- a. HANDS OFF. Avoid contact with any potential source of high voltage. Keep your hands out of the equipment when it is operating.
- b. AVOID ACCIDENTAL CONTACT. Make sure that some other part of your body does not come in contact with the high voltage circuits. It is easy to forget the hazards when you are concentrating on a frustrating or interesting task. Pens and badges in shirt pockets could cause contact.
- c. NEVER WORK ON HIGH VOLTAGE CIRCUITS WHEN YOU ARE ALONE. If anything should happen to you, your only chance may be prompt action by some other person. Be sure someone else is present and knows what to do in an emergency. (eg. how to shut the equipment off, first aid, who to call, etc.)
- d. USE ONE HAND WHEN WORKING WITH HIGH VOLTAGE CIRCUITS. Many people recommend that you put one hand in your pocket when you use a probe or other piece of equipment inside a high voltage section.

- e. DO NOT FLOAT MEASURING EQUIPMENT ABOVE GROUND. Make all measurement with respect to ground. The odds are that if you float the instrument, you may forget and reach inside the equipment. Although it is harder to get the right test setup, it is well worth the effort.
- f. DO NOT ASSUME THAT THE LEVEL OF RISK IS A FUNCTION OF SIZE. Some large high power high voltage equipment looks docile. One reason the equipment is so big is to get the proper separation between high voltage points. On the other hand, just because the equipment is small is no assurance of safety. Dense packaging results in more difficult access and increases the chance that you will accidentally hit the wrong point.
- g. ALWAYS DISCHARGE HIGH VOLTAGE CAPACITORS. High voltage capacitors store a lot of energy for long periods of time. High voltage capacitors also exhibit a "memory" in that they can recover after discharge and reach lethal levels. In addition to the "memory" problem, there have been instances where the built-in safety features have failed or been miswired. Each and every time you go to work on a piece of high voltage equipment use a grounding rod with a long handle to discharge every high voltage capacitor.
- h. DO NOT DEPEND ON THE AUTOMATIC FEATURES OF THE EQUIPMENT TO SAVE YOU. You never know when someone has left a circuit disabled, or if there has been a wiring error, or if a component has failed.

- i. TAKE PERSONAL RESPONSIBILITY TO ASSURE THAT NO ONE CAN TURN ON THE HIGH VOLTAGE CIRCUITS WHEN YOU ARE WORKING ON THE EQUIPMENT. Precautions would include taping down (or installing keepers) on controls/circuit breakers and/or disconnecting the power source to the high voltage circuits, activating interlocks that prevent high voltage turn on etc. Know where the disconnects are and use them. Do not rely on anyone not to turn on the high voltage.
- j. SET UP YOUR TEST EQUIPMENT WITH THE POWER OFF. Conduct the power-on operations when you have your hands out of the equipment.
- k. DO NOT USE SHORT PROBES FOR HIGH VOLTAGE MEASUREMENTS. A short probe does not allow any margin for error. If your hand slips you could accidentally come into contact with a danger point. A long probe avoids the whole problem.
- l. READ THE INSTRUCTION MANUAL. The best insurance is foreknowledge of hazards.
- m. CREATE A FAVORABLE ENVIRONMENT FOR SAFE OPERATIONS. This means that if people are crowding about you, stop the operation if it involves high voltage. Pressure can lead to carelessness. In the same way, fatigue is also an enemy. STAY ALERT AT ALL TIMES WHEN WORKING WITH HIGH VOLTAGE.
- n. DO NOT BECOME OVER CONFIDENT. Maintain a healthy respect for high voltage.

- o. A GOOD OPERATING PRACTICE IS TO CHECK THE POTENTIAL BETWEEN THE EQUIPMENT CHASSIS AND EARTH GROUND BEFORE YOU COMPLETE THE CIRCUIT WITH YOUR BODY. As voltage levels increase, the protection you get from insulation and air gap diminishes. For example, in a piece of equipment that involves beam voltages of about 16 KV, the beam transformers look very safe with massive insulation on the outside of the coils. Physical contact with the beam coil when the system is operating can be fatal. Although the equipment is placarded to warn people of the presence of high voltage, it is virtually impossible to placard every point of danger in a system.
- p. IF YOU DO NOT KNOW HOW THE EQUIPMENT WORKS AND WHAT THE HAZARDS ASSOCIATED WITH THE EQUIPMENT ARE IN SPECIFIC TERMS, DO NOT HANDLE THE EQUIPMENT. The greatest protection you can have when dealing with high voltage equipment is specific, detailed knowledge on that particular piece of equipment.
- q. AVOID "HAYWIRE" TEST SETUPS. It is easy to get in trouble if the setup you are using has a jumble of wires.
- r. MAKE SURE YOUR CONNECTIONS ARE SECURE. Do not allow leads to slip off and move about in an uncontrolled fashion. Even if it is not one of the high voltage leads, a free lead could (and generally does) move exactly to where you do not want it. The only safe connection is a mechanically secure one.
- s. WATCH OUT FOR UNTERMINATED HIGH VOLTAGE LEADS. Some connectors depend on circuit loading to avoid arcing between closely spaced terminals. Unloaded high voltage lines or plugs can lead to arcing situations.



- t. SHUT OFF THE HIGH VOLTAGE WHEN YOU ARE MAKING LOW VOLTAGE MEASUREMENTS. It does not make any sense to increase danger needlessly. While there may be times when you cannot shut off the high voltage during a low voltage measurement this is generally not the case.
- u. REMOVE THE TEST EQUIPMENT WHEN YOU HAVE FINISHED A MEASUREMENT PROGRAM. There has been many instruments destroyed or damaged because a test program was conducted in a haphazard manner rather than in an orderly progression from start to finish. Experience has shown many instances when a little order would have prevented a tragedy or avoided an expensive mistake.
- v. BE EXTREMELY WARY WHEN MAKING FILAMENT VOLTAGE MEASUREMENTS. The cathode of tubes is elevated above (or below) ground and the filament voltages usually cannot be made with reference to ground. Do everything you can to assure that the high voltage cannot be turned on when you are making your measurements. This includes disconnecting the high voltage drive source, shorting out appropriate leads, taping down switches and anything else you can think of to protect yourself.
- w. WHEN TROUBLE SHOOTING A UNIT ASSUME THAT THE SWITCHES AND COMPONENTS ARE DEFECTIVE. You may shut off the high voltage switch in some systems, but if the switch is defective you would still have the high voltage on. Returned units are potential booby traps.

- x. MAKE SURE THAT YOUR WORK STATION IS STABLE. Flimsy work surfaces or supports for the equipment or the test instruments represent a real threat. Do not use a setup that you know is unstable and/or dangerous.
- y. USE THE 30 SECOND RULE. Wait 30 seconds after you have shut off the equipment before you work on a unit. Part of the reason for the 30 second rule is that some of the dielectrics (insulators) used for high voltage circuits can store a charge. While the amount of charge stored is a function of the size of the object the 30 second rule provides an additional margin of safety.
- z. MAINTAIN A HEALTHY RESPECT FOR ANY KIND OF LIVE CIRCUITS. COMPLACENCY CAN HURT YOU OR KILL YOU. Your continued wariness is your best insurance against injury or death.





# MICROWAVE RADIATION PERSONNEL OPERATING GUIDELINES

## 1.0 INTRODUCTION

This guideline document presents operating practices appropriate for operators and technicians who work with equipment involving microwave radiation. Keep in mind that levels of microwave radiation that do not induce immediate physical discomfort in most individuals can be sufficiently high to induce longer term effects. Varian MCSD equipment usually is related to amplification of an RF signal from an external source. Even if a source is not connected to the amplifier you are working with, there are situations where the amplifier can go into a self induced mode and generate high levels of RF energy. This condition can exist if the unit is operated with the high voltage on and without proper termination on the input and output of the amplifier.

PROTECT YOURSELF AND THOSE AROUND YOU FROM UNWANTED RF EXPOSURE. ALWAYS TERMINATE THE AMPLIFIER INPUT AND OUTPUT WITH A RF DUMMY LOAD (or a short) BEFORE YOU TURN THE HIGH VOLTAGE ON. This will reduce the chances of oscillation due to internal amplifier noise.

## 2.0 DISCUSSION

Limit exposure to microwave radiation to prevent unwanted biological effects. There are other effects that can lead to problems if you are careless in operating or servicing microwave equipment. The permissible levels are quite low in comparison to the power levels of the amplifiers built by Varian. (eg less than 10 milliwatts vs 20 to 10,000 watts delivered by different units). Local radiation levels can be detected with the proper equipment. The permissible levels are currently being studied by a number of organizations. In the past the US Safety codes estab-

lished a dosage rate number of 10 mw/cm. sq. Currently there is consideration being given to reducing the permissible level to 1 mw/cm. sq. in the United States as has been the case for several European countries.

### 3.0 GENERAL GUIDELINES

The purpose of these guidelines is to provide practical approaches to control unwanted microwave energy associated with the operation and servicing of Varian equipment. The following approaches are effective in both laboratory or field environments.

- a. ALWAYS TERMINATE THE OUTPUT WAVEGUIDE OR CONNECTOR WITH A DUMMY RF LOAD (CAPABLE OF DISSIPATING FULL CW RF POWER) OR AN APPROPRIATE SHORT. SIMILARLY, TERMINATE THE INPUT TO AVOID THE POSSIBILITY OF THE AMPLIFIER BEING DRIVEN BY STAY LEAKAGE SIGNALS. Incorporate the terminations prior to applying prime power to the amplifier. This procedure prevents self oscillation and irradiation of the local environment.
- b. DO NOT LOOK INTO THE OUTPUT PORT OF A POWERED RF AMPLIFIER. Treat the powered amplifier as though it is a loaded gun. Your eyes are particularly vulnerable parts of your body.
- c. SHUT OFF THE UNIT IF YOU ARE TRYING TO LOCATE AN RF LEAK. As noted earlier, the levels of concern are very low. Examine the physical unit with the high voltage off. If you have to survey the RF runs with the power on to find the leaky joint or component, start by testing the system with a radiation meter. If the microwave radiation exceeds 0.5 mw/cm. sq. shut off the high voltage and consult your supervisor. Work quickly (not at a panic pace) to minimize the dose level. The dose you get is directly proportional to the power level and the time you are exposed.

Exposure to microwave radiation can induce both thermal and non-thermal biological effects, especially with the eyes. If you damage the lens of your eye by exposure to microwave radiation, cataracts can result. Consider that small microwave ovens are very effecting in cooking foods. If you follow these guidelines you can minimize exposure of yourself and other people in the area to excessive levels of microwave radiation associated with the operations that you control.







# WARRANTY

## LIMITED WARRANTY FOR PRODUCTS OF MICROWAVE EQUIPMENT DIVISION VARIAN ASSOCIATES, INC.

### 1. WARRANTY

a. Equipment, components, and subsystems (i.e. "Products"), exclusive of microwave tubes, manufactured and sold by Varian Microwave Equipment Division (MED) are warranted to be free of defects in material and workmanship for a period of one (1) year except as otherwise specified on Varian's quotation or agreed to in writing by Varian. Varian's obligation under all MED warranties is limited in accordance with the periods of time and all other conditions stated in all provisions of this warranty.

b. This warranty applies only to defects in material and workmanship in Products manufactured by Varian, including non-Varian parts, except microwave tubes. Varian makes no warranty whatsoever concerning Products or Accessories not of its manufacture.

c. Microwave tubes, which are supplied as an integral part of MED Products, are warranted only in accordance with the Tube Manufacturer's applicable warranty.

d. Power Supplies and passive components which include electromagnets, solenoids, filters, waterloads, circulators, couplers, waveguide windows, diplexers, and other passive devices are warranted for one (1) year of unlimited hours of operation following the date of shipment thereof, unless otherwise specified.

e. Repair, or at Varian's option, replacement of the Varian Products or defective parts therein shall be the sole and exclusive remedy for all valid warranty claims; provided that under certain circumstances Varian may, as an alternative, elect to refund an equitable portion of the purchase price of the Product.

### 2. WARRANTY PERIOD

The applicable warranty period shall commence on the date of shipment from Varian's Microwave Equipment Division (MED) to the original purchaser and extend for the stated period following the date of shipment. The warranty period for microwave tubes shall commence on the date of shipment from MED and extend for the specified number of hours of operation in accordance with the terms of the applicable express written warranty of the Tube Manufacturer. Upon beginning of the applicable Varian warranty period, all customer's remedies shall be governed by the terms stated or referenced in this warranty. In-warranty repaired or replacement Products or parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced Products or parts. Repair or replacement of Products or parts under warranty does not extend the original warranty period.

### 3. WARRANTY COVERAGE LIMITATIONS

a. The following are expressly **not covered** under warranty:

1) Any loss, damage, and/or malfunction relating in any way to shipping, storage, accident, abuse, alteration, misuse,

neglect, failure to use Products under normal operating conditions or within respective Varian specified ratings, failure to use Products according to any operating instructions provided by Varian, lack of routine care and maintenance as indicated in any operating or maintenance instructions, or failure to use or take any proper precautions under the circumstances.

2) Products, items, parts, accessories, subassemblies, or components which are expendable in normal use or are of limited life, such as but not limited to bulbs, fuses, lamps, glassware, etc.

3) Microwave tubes, except as provided in the Tube Manufacturer's applicable express written warranty.

b. Varian reserves the right to revise the foregoing list of what is not covered under this warranty.

### 4. WARRANTY REPLACEMENT AND ADJUSTMENT

The Warranty Replacement and Adjustment provisions stated in the standard Terms and Conditions of Sale, Electron Device Group, Varian Associates, Inc., are incorporated herein by reference. In addition thereto, the following provisions shall apply to replacement of parts under warranty in MED Products.

a. At Varian's sole option, it may furnish warranty replacement parts to the Customer before the defective part is returned to and received by Varian. If Varian furnishes such parts in advance, the Customer understands and agrees that it will return the replaced defective parts to Varian within sixty (60) days after Varian's advance shipment. In the event defective parts are not returned and received by Varian within this sixty (60) day period, the advance replacement parts shall be deemed not furnished under warranty and Customer agrees to pay Varian's invoices for all such advance shipment replacement parts at their then current selling prices.

b. Varian will not make warranty adjustments for failures of Products or parts which occur after the specified warranted hours of operation or after the specified maximum adjustment period. Unless otherwise agreed, failure shall be deemed to have occurred no more than seven (7) working days before the first date on which a notice of failure is received by Varian. Under no circumstances shall any warranty exceed the period stated above unless expressly agreed to in writing by Varian. In the event Customers and/or users of any Varian MED Products subject to this warranty fail to keep accurate records of the number of hours of operation or time period of use, Varian, at its sole discretion, may reject any such claims or determine probable usage for the equipment, component, or subsystem involved.

### 5. LIABILITY LIMITATIONS

a. THIS WARRANTY IS EXPRESSLY IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR PARTICULAR PURPOSE, USE, OR APPLICATION, AND ALL OTHER OBLIGA-



TIONS OR LIABILITIES ON THE PART OF VARIAN, UNLESS SUCH OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES ARE EXPRESSLY AGREED TO IN WRITING BY VARIAN.

b. All obligations of Varian under this warranty shall cease in the event its Products or parts thereof have been subjected to accident, abuse, alteration, misuse or neglect, or which have not been operated and maintained in accordance with proper operating procedures.

c. IN NO EVENT SHALL VARIAN BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR RESULTING LOSS OR DAMAGE OF ANY KIND HOWSOEVER CAUSED. VARIAN'S LIABILITY FOR DAMAGES SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY VARIAN FOR THE

UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE.

d. No action, regardless of form, arising out of, or in any way connected with, the Products, or services, furnished or to be furnished by Varian, may be brought by the Customer more than one (1) year after the cause of action has accrued. All patent liability of Varian shall be determined solely in accordance with the standard Terms and Conditions of sale, Electron Device Group, Varian Associates, Inc.

e. Statements made by any person, including representatives of Varian, which are inconsistent or in conflict with the terms of this warranty, shall not be binding upon Varian unless reduced to writing and approved by an officer of Varian.

## **RETURN PROCEDURES**

### **6. WARRANTY CLAIM**

All claims under warranty must be made promptly after occurrence of circumstances giving rise to the claim and must be received within the applicable warranty period by Varian or its authorized representative. Varian reserves the right to reject any warranty claim not promptly reported. After expiration of the applicable warranty period, Microwave Tubes, Power Supplies and Components are not subject to adjustment.

*Unnecessary expense and loss of time often can be avoided by calling the local Varian Field Office before returning a Product to the factory. Returned Products are frequently found to be within performance specifications required of new Products. The Varian representative may be able to determine the trouble and obtain satisfactory performance from the Product. This may save shipping time and expense and minimize equipment down time.*

### **7. WARRANTY CLAIM FORM**

Before any Product is returned for repair and/or adjustment, written authorization from Varian for the return and instructions as to how and where the Product should be shipped must be obtained. The Product type and serial numbers and a full description of the circumstances giving rise to the warranty claim should be included. Such information will help establish the cause of failure and expedite adjustment or repair. For this purpose, a **Warranty Claim Form** is shipped with each Product.

### **8. IMPORTANT**

*Any Product returned without a completed claim form will be considered to have met all contractual requirements. Both the Product and the completed claim form must be submitted to Varian Associates, Inc. prior to expiration of the applicable warranty period.*

### **9. TRANSPORTATION AND PACKAGING**

Any Product returned to Varian for examination must be sent prepaid via the means of transportation indicated as ac-

ceptable by Varian. Varian reserves the right to reject any warranty claim on any item that has been altered or has been shipped by nonacceptable means of transportation. Returned Products should be carefully packaged in the original container, and unless otherwise indicated, shipped to:

VARIAN ASSOCIATES, INC.  
Microwave Equipment Division  
3200 Patrick Henry Drive  
Santa Clara, California 95054

Attn: Customer Support

### **10. AUTHORIZATION FOR EVALUATION**

When any Product is returned for examination and inspection, or for any other reason, Customer and its shipping agency shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or nonconformity in the Product. By returning a Product, the owner grants Varian Associates, Inc. permission to open and disassemble the Product as required for evaluation. In all cases Varian has sole responsibility for determining the cause and nature of failure, and Varian's determination with regard thereto shall be final.

If it is found that Varian's Product has been returned without cause and is still serviceable, the Customer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may, in Varian's sole discretion, be made on Product so returned.

Varian Microwave Equipment Division Products are manufactured by Varian Associates, Inc./Headquarters: 611 Hansen Way, Palo Alto, California 94303. Address all inquiries regarding MED warranties to the Microwave Equipment Division, 3200 Patrick Henry Drive, Santa Clara, California 95054.





# LIMITED WARRANTY

SUBJECT TO THE TERMS AND CONDITIONS BELOW AND  
ON THE REVERSE SIDE OF THIS FORM

## MICROWAVE TUBES, POWER SUPPLIES AND COMPONENTS MICROWAVE TUBE DIVISION OF VARIAN ASSOCIATES, INC.

### WARRANTY

Microwave Tubes and Devices (Products) sold by Varian are warranted against defects in workmanship and material when used under normal operating conditions within the respective Varian specified ratings and in accordance with Varian operating instructions. The applicable Microwave Device warranty period shall commence on the date of shipment from Varian and extend for a specified number of hours of operation of the filament or heater, or for a specified number of months following the date of shipment thereof, whichever first occurs. The applicable number of hours of operation of the filament or heater included in the warranty for a Microwave Tube Device depends upon the type of device. The most common periods of warranty are listed below:

| CODES |               |                                                |                                    |
|-------|---------------|------------------------------------------------|------------------------------------|
| Group | Warranty Code | Warranted Filament or Heater Operation (Hours) | Maximum Adjustment Period (Months) |
| A     | W-U           | Unlimited                                      | 12                                 |
|       | W-1000        | 1000                                           | 12                                 |
|       | W-2000        | 2000                                           | 12                                 |
|       | W-5000        | 5000                                           | 12                                 |
|       | W-7500        | 7500                                           | 24                                 |
|       | W-10,000      | 10,000                                         | 36                                 |
|       | W-U           | Unlimited                                      | 36                                 |
| B     | C-1           | N/A                                            | 12                                 |
| C     | WC-5000       | 5000                                           | 12                                 |
|       | WC-7500       | 7500                                           | 12                                 |
|       |               | Non-Pro Rata Period (Months)                   | Pro Rata Period (Months)           |
| D     | W-12          | 4                                              | 12                                 |
|       | W-18          | 6                                              | 18                                 |
|       | W-24          | 8                                              | 24                                 |
|       | W-36          | 6                                              | 36                                 |

### ADJUSTMENTS

Repair, or at Varian's option, replacement of the Product or defective parts therein shall be the sole and exclusive remedy under valid warranty claims; provided that Varian may, as an alternative, elect to refund an equitable portion of the purchase price of the Product in accordance with the following adjustment criteria.

If a Microwave Tube in Group A fails from causes covered by this warranty within the warranted hours of operation and maximum adjustment period, a pro rata adjustment, based on the selling price, will be made as follows:

$$\text{Adjustment} = \frac{(\text{Applicable Selling Price}) \times (\text{Warranted Hours} - \text{Hours of Operation at Failure})}{\text{Warranted Hours}}$$

Passive Components in Group B, including electromagnets, solenoids, filters, waterloads, circulators, couplers, waveguide windows, duplexers, and other passive devices are warranted for unlimited hours of operation during the one year period following data of shipment thereof unless otherwise specified.

If a Reflex Klystron/BWO Microwave Tube in Group C fails from causes covered by this warranty within the warranted

hours of operation and maximum adjustment period, a pro rata adjustment, based on selling price, will be made at Varian's discretion, on one of the two (2) following bases:

$$\text{Adjustment} = \frac{(\text{Applicable Selling Price}) \times (\text{Warranted Period} - \text{Months from Date of Shipment})}{\text{Warranted Period}}$$

$$\text{Adjustment} = \frac{(\text{Applicable Selling Price}) \times (\text{Warranted Hours} - \text{Hours of Operation at Failure})}{\text{Warranted Hours}}$$

If a unit in Group D fails from causes covered by this warranty within the warranted period of operation, an adjustment based on selling price will be made as follows:

$$\text{Adjustment} = \frac{(\text{Applicable Selling Price}) \times (\text{Warranted Period} - \text{Months from Date of Shipment})}{\text{Warranted Period}}$$

(2) Except the non-pro rata period shall be 100% adjustment.

No adjustment will be made for failure beyond the warranted hours of operation or beyond the maximum adjustment period. In all cases failure shall be deemed to have occurred no more than seven days before the first date on which notice of failure is received by Varian.

Varian shall have no obligations under this warranty unless the applicable warranty period (number of hours of operation of the filament or heater, and/or number of months from date of shipment) is specified on Varian's quotation, or is otherwise agreed to in writing by Varian. In the event Customers and/or users of any Microwave Tube subject to warranty claim fail to keep accurate records of the number of hours of operation of the filament or heater, Varian, in its sole discretion, may reject any such claim or determine probable usage of the Product.

This warranty is expressly in lieu of and excludes all other warranties of any kind, express or implied, including warranties of merchantability and of fitness for intended purpose, use, or application, and all other obligations or liabilities on the part of Varian, unless such other warranties, obligations or liabilities are expressly agreed to in writing by Varian.

### LIABILITIES

Varian's aggregate liability of damages shall not exceed the payment, if any, received by Varian for the Unit of Product or service furnished or to be furnished, as the case may be, which is the subject of claim or dispute. In no event shall Varian be liable for incidental, consequential or special damages. Liability to third parties for bodily injury, including death, resulting from Varian's performance shall be determined in accordance with applicable law, and the total liability limitation stated above shall not be construed as a limitation on Varian for damages for any such bodily injury, including death. No action, regardless of form, arising out of, or in any way connected with, Products or services furnished by Varian, may be brought by Customer more than one (1) year after the cause of action has accrued. All patent liability of Varian shall be determined solely in accordance with the standard Terms and Conditions of Sale, Electron Device Group, Varian Associates, Inc.

## WARRANTY RETURN PROCEDURES AND ADDITIONAL CONDITIONS OF COVERAGE

### WARRANTY CLAIM

All claims under warranty must be made promptly after occurrence of circumstances giving rise to the claim and must be received within the applicable warranty period by Varian or its authorized representative. Varian reserves the right to reject any warranty claim not promptly reported. After expiration of the applicable warranty period, Microwave Tubes, Power Supplies and Components are not subject to adjustment.

*Unnecessary expense and loss of time often can be avoided by calling the local Varian Field Office before returning a Product to the factory. Returned Products are frequently found to be within performance specifications required of new Products. The Varian representative may be able to determine the trouble and obtain satisfactory performance from the Product. This may save shipping time and expense and minimize equipment down time.*

### WARRANTY CLAIM FORM

Before any Product is returned for repair and/or adjustment, written authorization from Varian for the return and instructions as to how and where the Product should be shipped must be obtained. The Product type and serial numbers and a full description of the circumstances giving rise to the warranty claim should be included. Such information will help establish the cause of failure and expedite adjustment or repair. For this purpose, a **Warranty Claim Form** is shipped with each Product.

### IMPORTANT

*Any Product returned without a completed claim form will be considered to have met all contractual requirements. Both the Product and the completed claim form must be submitted to Varian Associates, Inc. prior to expiration of the applicable warranty period.*

### LIQUID COOLED PRODUCTS

All obligations of Varian under this warranty shall cease and no adjustment, credit or refund shall be made with respect to any liquid cooled Products in which any water coolant has

been allowed to remain after removal of the Product from operation. Water coolant remaining in the cooling passages may freeze while the Product is in storage or transit and may damage the Product beyond repair. All water coolant must be blown out of the Product cooling passages by the Customer immediately after removal from operation.

### TRANSPORTATION AND PACKAGING

Any Product returned to Varian for examination must be sent prepaid via the means of transportation indicated as acceptable by Varian. Varian reserves the right to reject any warranty claim on any item that has been altered or has been shipped by nonacceptable means of transportation. Returned Products should be carefully packed in the original container, and unless otherwise indicated, shipped to:

**VARIAN ASSOCIATES, INC.**  
Microwave Equipment Division  
3200 Patrick Henry Drive  
Santa Clara, California 95054

**Attn: Customer Support**

### AUTHORIZATION FOR EVALUATION

When any Product is returned for examination and inspection, or for any other reason, Customer and its shipping agency shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or nonconformity in the Product. By returning a Product, the owner grants Varian Associates, Inc. permission to open and disassemble the Product as required for evaluation. In all cases Varian has sole responsibility for determining the cause and nature of failure, and Varian's determination with regard thereto shall be final.

If it is found that Varian's Product has been returned without cause and is still serviceable, the Customer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may, in Varian's sole discretion, be made on Products so returned.



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# WARRANTY CLAIM FORM FOR MICROWAVE AMPLIFIERS, POWER SUPPLIES AND COMPONENTS

PROPER COMPLETION OF THIS FORM IS VITALLY  
IMPORTANT TO THE PROMPT AND EFFICIENT  
HANDLING OF PRODUCT WARRANTY CLAIMS.

I. This claim form, properly completed, must accompany any returned Product and be received by Varian Microwave Equipment Division prior to expiration of the adjustment period. Compliance with this requirement assures the user of the most prompt and thorough service possible. A Product returned within the adjustment period, but without the completed Warranty Claim Form, will be treated as out of warranty.

II. Complete the following information regarding the Product being returned:

A. Product Type: \_\_\_\_\_ Varian Part No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Customer Part No. \_\_\_\_\_

B. Customer Purchase Order No. \_\_\_\_\_

Date of Purchase Order \_\_\_\_\_

C. Control Specification Number \_\_\_\_\_ Dated \_\_\_\_\_

(Check one) Document of VA ☐

Your Company ☐

D. Contract Warranty (either Varian Warranty code or specification paragraph)

\_\_\_\_\_

Filament Hours \_\_\_\_\_ Warranty Adjustment Began \_\_\_\_\_  
(if applicable)

Adjustment Time \_\_\_\_\_ (Months) Expires \_\_\_\_\_

III. Claim is made against warranty based on the following:

A. Specification(s) not met by the Product (list by specification and paragraph number):

**PLEASE FILL IN FOR FAILED PRODUCTS (AS APPLICABLE)** (Place an "X" in the appropriate box to show what v  
from normal was seen at the time of failure).

| Product Serial No.* | Date Installed | Date Failed | Filament Hours | Radiate Hours | Filament Current | Beam Current | Helix or Body Current | Hi Voltage Arcs | W/G Arcs | Coolant Flow | Mech. Problems | Electro Magnet Current |
|---------------------|----------------|-------------|----------------|---------------|------------------|--------------|-----------------------|-----------------|----------|--------------|----------------|------------------------|
| Type No.            |                |             |                |               | Lo Hi            | Lo Hi        | Nml Hi                | No Yes          | No Yes   | Nml Lo       | No Yes         | Nml Lo                 |
|                     |                |             |                |               |                  |              |                       |                 |          |              |                |                        |
|                     |                |             |                |               |                  |              |                       |                 |          |              |                |                        |
|                     |                |             |                |               |                  |              |                       |                 |          |              |                |                        |
|                     |                |             |                |               |                  |              |                       |                 |          |              |                |                        |

Subsystem Serial No. (if applicable) \_\_\_\_\_

\*It is necessary to have the Product serial number rather than the system serial number.

- B. Describe the circumstances and/or sequence of events under which the Product failed. Include remarks relating to installation problems, system anomalies, etc.

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IV. Purchaser's Name \_\_\_\_\_

Address \_\_\_\_\_

Claim made by: \_\_\_\_\_

Person to contact for additional information:

Name \_\_\_\_\_

Telephone \_\_\_\_\_

(Signature) \_\_\_\_\_

(Date) \_\_\_\_\_

Return completed form promptly, with Product, to:

Varian Associates, Inc.  
Microwave Equipment Division  
3200 Patrick Henry Drive  
Santa Clara, CA 95054

Telephone: (408) 496-6273  
TWX: 910-338-0264

Attention: Returned Products

# WARRANTY CLAIM FORM FOR MICROWAVE TUBES, POWER SUPPLIES AND COMPONENTS

PROPER COMPLETION OF THIS FORM IS VITALLY  
IMPORTANT TO THE PROMPT AND EFFICIENT  
HANDLING OF PRODUCT WARRANTY CLAIMS.

I. This claim form, properly completed, must accompany any returned Product and be received by Varian Microwave Equipment Division prior to expiration of the adjustment period. Compliance with this requirement assures the user of the most prompt and thorough service possible. A Product returned within the adjustment period, but without the completed Warranty Claim Form, will be treated as out of warranty.

II. Complete the following information regarding the Product being returned:

A. Product Type:                      Varian Part No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Customer Part No. \_\_\_\_\_

B. Customer Purchase Order No. \_\_\_\_\_

Date of Purchase Order \_\_\_\_\_

C. Control Specification Number \_\_\_\_\_ Dated \_\_\_\_\_

(Check one) Document of VA ☐

Your Company ☐

D. Contract Warranty (either Varian Warranty code or specification paragraph)

\_\_\_\_\_

Filament Hours \_\_\_\_\_  
(if applicable)

Warranty Adjustment Began \_\_\_\_\_

Adjustment Time \_\_\_\_\_ (Months)

Expires \_\_\_\_\_

III. Claim is made against warranty based on the following:

A. Specification(s) not met by the Product (list by specification and paragraph number):



PLEASE FILL IN FOR FAILED PRODUCTS (AS APPLICABLE) (Place an "X" in the appropriate box to show what variance from normal was seen at the time of failure).

| Product Serial No.* | Date Installed | Date Failed | Filament Hours | Radiate Hours |  | Filament Current |    | Beam Current |    | Helix or Body Current |    | Hi Voltage Arcs |     | W/G Arcs |     | Coolant Flow |    | Mech. Problems |     | Electro-Magnet Current |    |
|---------------------|----------------|-------------|----------------|---------------|--|------------------|----|--------------|----|-----------------------|----|-----------------|-----|----------|-----|--------------|----|----------------|-----|------------------------|----|
| Type No.            |                |             |                |               |  | Lo               | Hi | Lo           | Hi | Nml                   | Hi | No              | Yes | No       | Yes | Nml          | Lo | No             | Yes | Nml                    | Lo |
|                     |                |             |                |               |  |                  |    |              |    |                       |    |                 |     |          |     |              |    |                |     |                        |    |
|                     |                |             |                |               |  |                  |    |              |    |                       |    |                 |     |          |     |              |    |                |     |                        |    |
|                     |                |             |                |               |  |                  |    |              |    |                       |    |                 |     |          |     |              |    |                |     |                        |    |
|                     |                |             |                |               |  |                  |    |              |    |                       |    |                 |     |          |     |              |    |                |     |                        |    |

Subsystem Serial No. (if applicable) \_\_\_\_\_

\*It is necessary to have the Product serial number rather than the system serial number.

B. Describe the circumstances and/or sequence of events under which the Product failed. Include remarks relating to installation problems, system anomalies, etc.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

IV. Purchaser's Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Claim made by: \_\_\_\_\_

Person to contact for additional information:

Name \_\_\_\_\_

Telephone \_\_\_\_\_

(Signature) \_\_\_\_\_

(Date) \_\_\_\_\_

Return completed form promptly, with Product, to:

Varian Associates, Inc.  
Microwave Equipment Division  
3200 Patrick Henry Drive  
Santa Clara, CA 95054

Telephone: (408) 496-6273  
TWX: 910-338-0264

Attention: Returned Products







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